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OBSERVATIONS ON THE COCCIDAE OF FORMOSA PART V

ALEYRODIDAE OF FORMOSA PART IV

By

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OBSERVATIONS ON THE COCCIDAE OF FORMOSA. V.

By

Ryoichi TAKAHASHI

Introduction.

In the present paper are described 12 species and 5 varieties new to science, with notes on some forms new to or already known from Formosa. Notes on some of the natural enemies[1] and a list of new food plants in the island are also given, and a new genus is erected for an interesting species attacking the trees of *Actinodaphne* (Lauraceae). The insects here treated include many species of economic importance, which feed on cultivated plants.

Since the publication of the first part (1929) of this series of papers, in which several parasitic Hymenopterons were recorded, *Anysis saissetiae* ASHM., *Prospaltella niigatae* NAKAY. and *P. singularis* SILV. have been found parasitizing *Saissetia oleae* BERN., *Diaspis pentagona* TARG. and *Lepidosaphes beckii* NEWM., while *Coccophagus hawaiiensis* TIMB. and *Aphelinus chrysomphali* MERCET have been reared from the new hosts, *Saissetia nigra* NIETN. and *Aspidiotus destructor* SIGNT.[2], respectively.

Although considerable attention has not been devoted to the study of the natural enemies of these insects in Formosa, observations have led me to believe that all the species on cultivated plants are commonly preyed upon or parasitized by one or more insects or fungi and it is unnecessary at present to introduce natural enemies for the control of any species.

In the spring of 1934 I had the opportunity of examining the native citrus, *Citrus aurantium*, var. *tachibana*, remotely isolated from cultivated plants, in a

(1) See the notes on *Pulvinaria maxima* GREEN.

(2) Other parasites have been also found, but have not been identified, which include *Microterys* sp., *Anagyrus* sp., *Aphelinus* sp., *Tetrastichus* sp. and *Aphanogmus* sp., parasitizing *Pulvinaria psidii* Mask., *Pseudococcus*, *Aulacaspis yabunikkei* KUW., *Ceroplastes rubens* MASK. and *Aulacaspis crawi* Ckll., respectively.

wild forest at Mutosan in Heito District, Takao Prefecture, which was infested by a few individuals of *Fiorinia theae* GREEN and an undetermined species of *Lepidosaphes*.[3] The former, a pest of citrus in the lowlands, also attacks some wild plants such as *Eurya* and *Thysanospermum* in the mountainous regions, and these facts probably indicate that the species is native to the island and is not of a recent introduction, though most of the species[4] on the cultivated citrus in the island are no doubt introduced forms.

The pineapple mealy bug, *Pseudococcus brevipes* CKLL., in Formosa feeds on only pineapple and no single individual has been detected on other plants, whereas it attacks a wide range of plants in addition to pineapple in other countries. It must be assumed that in Formosa this species is represented by a single race confined to pineapple, indicating that the species is a form recently introduced. A similar fact is also seen in *Thrips tabaci* LIND., which is restricted to onions only in the island, though extensively polyphagous in other countries.

This paper is the last installment under this general title, and the results of my further observations will be published in other journals.

The type specimens are preserved in the collection of our Department.

I express here my cordial thanks to Prof. T. SHIRAKI and Mr. E. E. GREEN for their kind help in the course of the work, and am also indebted to prof. F. SILVESTRI and Dr. T. ISHII, who have identified the parasitic Hymenoptera.

New food plants of the Formosan Coccidae.

Acer kawakamii (Aceraceae).

Aulacaspis mangiferae NEWST. var. aceris TAKAH.

Actinodaphne mushaensis (Lauraceae).

Paracardiococcus actinodaphnis TAKAH.

Adiantum flabellulatum (Polypodiaceae).

Pinnaspis aspidistrae SIGNT.

Agalma lutchuense (Araliaceae).

Lepidosaphes bladhiae TAKAH.

Arundo formosana (Gramineae).

Tsukushiaspis phragmitis TAKAH.

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(3) The specimens are incomplete and are not determined.

(4) *Chrysomphalus aurantii* MASK. is also found on various wild plants in the mountainous regions and does not seem to be a species recently introduced.

Bambusa stenostachya (Gramineae).

Asterolecanium coronatum GREEN.

Bauhinia championi (Leguminosae).

Protopulvinaria agalmae TAKAH.

Bobua arisanensis (Symplocaceae).

Saissetia bobuae TAKAH.

Broussonetia papyrifera (Moraceae).

Saissetia nigra NIETN.

Buchanania arborescens (Anacardiaceae).

Fiorinia fioriniae TARG.

Camellia sp. (Camelliaceae).

Phenacaspis dilatata GREEN.

Carica papaya (Caricaceae)

Chrysomphalus aurantii MASKELL.

Coccus discrepans GREEN (Formerly recorded as C. hesperidum L.).

Celtis sinensis (Ulmaceae).

Lepidosaphes takaoensis TAKAH.

Chrysaldocarpus lutescens (Palmae).

Aspidiotus destructor SIGNT.

Eucalymnatus tessellatus SIGNT.

Parlatoria proteus CURTIS.

Cinnamomum erythrophloia (Lauraceae).

Diaspis machilicola TAKAH. var. cinnamomicola TAKAH.

Cinnamomum sp.

Aonidia tentaculata GREEN, var, formosana TAKAH.

Codiaeum variegatum (Euphorbiaceae).

Lepidosaphes tokionis KUWANA.

Diospyros erianthi (Ebenaceae).

Chrysomphalus rossi MASK.

Protopulvinaria agalmae TAKAH.

Pseudaonidia trilobitiformis GREEN.

Eurya sp. (Camelliaceae).

Aspidiotus transparens GREEN.

Ficus foveolata (Moraceae).

Aspidiotus transparens GREEN.

Gelonium aequoreum (Euphorbiaceae).

Coccus elongatus SIGNT.

Icerya aegyptiaca DOUGL.

Gossypium sp. (Malvaceae).

Ferrisiana virgata CKLL.

Heterosmilax japonica (Liliaceae).

Lepidosaphes bladhiae TAKAH.

Illicium anisatum (Magnoliaceae).

Lepidosaphes bladhiae TAKAH.

I. randaiense.

Chrysomphalus aurantii MASK.

Parlatoria crotonis DOUGL.

Lithocarpus sp. (Fagaceae).

Neoparlatoria lithocarpi TAKAH.

Parlatoria lithocarpi TAKAH.

Machilus sp. (Lauraceae).

Diaspis machilicola TAKAH.

Maesa sp. (Myrsinaceae).

Aspidiotus transparens GREEN.

Lepidosaphes bladhiae TAKAH.

Mentha sp. (Labiatae).

Pseudococcus filamentosus CKLL.

Miscanthus spp. (Gramineae).

Aulacaspis kuzunoi KUWANA, var. divergens TAKAH.

Modecca formosana (Passifloraceae).

Eucalymnatus tessellatus SIGNT.

Murraya sp. (Rutaceae).

Coccus elongatus SIGNT.

Nephelium litchi (Sapindaceae).

Ceroplastes ceriferus AND.

Saissetia formicarii GREEN.

Oreocnide pedinculata (Urticaceae).

Pinnaspis aspidistrae SIGNT.

Osmanthus sp. (Oleaceae).

Parlatoria proteus CURTIS.

Pandanus tectorius (Pandanaceae).

Chrysomphalus aurantii MASK.

Phyllanthus takaoensis (Euphorbiaceae).

Pulvinaria maxima GREEN.

Podocarpus macrophylla (Podocarpaceae).

Pinnaspis aspidistrae SIGNT.

Pyracantha koidzumii (Rasaceae).

Chrysomphalus rossi MASK.

Lepidosaphes pallida GREEN.

Saissetia hemisphaerica TARG.

Quercus sp. (Fagaceae).

Phenacaspis taiwana TAKAH.

Q. pseudomyrsinaefolia.

Phenacaspis rotunda TAKAH.

Rhododendron sp. (Ericaceae).

Aspidiotus chipponsanensis TAKAH.

A. excisus GREEN.

A. shakunagi TAKAH.

Fiorinia rhododendri TAKAH.

Rohdea japonica (Liliaceace).

Coccus hesperidum L.

Saccharum officinarum (Gramineae).

Aulacaspis wakayamensis KUWANA.

Scolopia oldhami (Flacourtiaceae).

Aspidiotus transparens GREEN.

Chrysomphalus rossi MASK.

Paralecanium expansum GREEN, var. quadrata GREEN.

Sideloxylon ferrugineum (Sapotaceae).

Saissetia oleae BERN.

Vitis sp. (Vitaceae).

Chrysomphalus rossi MASK.

Leucodiaspis vitis TAKAH.

Paralecanium expansum GREEN.

Parlatoria proteus CURTIS.

New or little-known Formosan Coccidae.

Asterolecanium coronatum GREEN.

Cocc. Ceylon, IV, p. 327 (1909).

Host.—Bambusa stenostachya, attacking the stem.

Hab.—Taihoku.

Numerous females were found in groups on November 21, 1933. Previously known from Ceylon.

Coccus discrepans GREEN.

Lecanium discrepans, GREEN, Cocc. Ceylon, p. 204 (1904); RAMAKRISHNA AYYAR, Imp. Inst. Agr. Res. Pusa, India, Bull. 197, p. 50 (1929).

Coccus discrepans, MORRISON, Philip. Jl. Sc., XVIII, p. 654 (1921).

Hosts.—Glochidion sp., Maesa pedicellata, Carica papaya, Cocos nucifera, Callicarpa formosana.

Hab.—Taihoku, Shinten, Kagi, Tainan Heito.

Rather common, usually being protected with shelters by *Crematogaster*. Formerly confused with *Coccus hesperidum* L. (Part 1, p, 50). Mr. E. E. GREEN has kindly examined the Formosan specimens and writes me that they agree with several examples of *C. discrepans* in his collection, in which the marginal setae are not so markedly fimbriate.

Paracardiococcus new genus.

(Adult female) Covered with a brittle waxy scale not cemented to the body. Antennae and legs rudimentary, not segmented, the latter with a claw. Marginal setae very few, conical, stout. Stigmatic clefts represented by shallow concaves with many pores in a group and large conical spines surrounding the group of pores, wanting sclerotic plates. Spiracles large. Anal cleft very short, widely opening. Anal plates normal in shape, surrounded with a sclerotic band on the anterior part, with very stout setae on the distal part. Tubular ducts of 2 types, the larger ducts numerous on the submarginal area of dorsum, the very thin ducts present on the venter and marginal area; 8-shaped pores and cribriform plates absent.

Genotype.—*Paracardiococcus actinodaphnis* new species.

Differs from *Cardiococcus* CKLL. in lacking 8-shaped pores and in the characters of stigmatic clefts, and from *Cryptostigma* Ferris in possessing tubular ducts and in the absence of a sclerotic plate at the stigmatic cleft.

Paracardiococcus actinodaphnis new species.

(Adult female) Entirely covered with a white brittle secretion, which is slightly pale yellowish, oblong, nearly parallel on the sides, rounded on both ends, not convex, not cemented to the body, about 1.5 mm. long, about 0.55 mm. wide. Body

dark brown in dried specimens, not sclerotic, broad, about 1.5 times as long as wide, nearly parallel on the sides, broadly rounded on both ends, scarcely convex dorsally, segments distinct on the median area of dorsum. Antennae rudimentary, a little wider than long, broadened towards the base, broadly rounded apically, not segmented, widely separated, nearer to the front margin of body than to the rostrum, with some 10 long stout setae mostly on the distal part, which setae are stiff or slightly curved and nearly as long as the antennae. Rostrum moderate in size, short, wider than long, conical, not segmented; the loop reaching the hind legs. Legs rudimentary, very small, not segmented, much wider than long, conical, as long as the antennae (including the claw), with some short setae, and a short claw at the tip; the claw pointed apically, conical, distinctly longer than wide, much shorter than the legs, not or slightly curved, not well defined from the legs. Spiracles large, stout, longer than wide, a little constricted on the middle, not distinct in outline, with areolations on the base, anterior spiracles present laterad of the front legs, the posterior ones behind the middle legs; some 20–25 rather large circular quinquelocular pores present in a wide group between the spiracle and marginal cleft; the pores much thickend on the margin, with the divisions rounded. Marginal clefts very shallow, only concaves, with some 6–9 large spines in a dense row encircling the concave except on the mesal side; the spines nearly subequal in length, similar in shape to, but a little longer than the marginal spines, directed to the center of the concave; some 10–12 multilocular pores present in a rather dense group in the concave, which are larger than the pores between the spiracles and concaves, much thickened on the margin, and nearly as large in diameter as the basal part of the spine, with the central part rather small. Marginal spines conical, sharply pointed, much longer than wide, a little swollen on the basal part, very few, usually absent on the front margin, 2–6 in front of the anterior stigmatic cleft on each side, 2 between the anterior and posterior clefts, 7–9 in an irregular row between the posterior cleft and hind end of body, and 2 much longer ones present on each margin of anal cleft. Anal cleft very short, widely opening. Anal plates much longer than wide, rounded on the margin except on the mesal side, narrowed

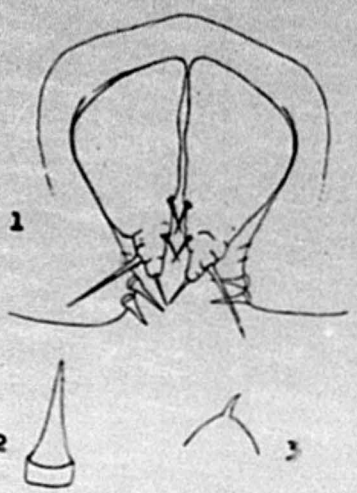

Fig. 1.
Paracardiococcus actinodaphnis n. sp.
(Adult female)
1. Anal cleft and anal plates.
2. Marginal spine.
3. Leg.

on the distal part, with a very long stout spine near the apex and 3 shorter spines on the distal part, the longer spine reaching beyond the hind end of body. Venter rather broadly sclerotic along the bases of anal plates. Anal ring small, with 6 very long stout setae not reaching the apices of anal plates. Some small stiff setae present in a row on the submarginal area, which are fewer and much shorter than the marginal spines. Numerous tubular ducts present mostly on the submarginal area of dorsum, but much fewer on the median area; numerous very thin long filiform tubular ducts also scattered on the marginal area and venter; numerous small circular pores scattered on the median part of venter, which are much thickened on the margin, with no divisions. Dorsum with numerous very short transverse rows of minute spinules on the median area of abdomen and some 10 very short stiff setae in a transvers row on the abdominal segment.

Length of body—about 1.0 mm., antenna—about 0.023 mm., spine in stigmatic cleft—about 0.023 mm., marginal spine—about 0.018 mm., anal plate—about 0.138 mm., width of anal plate—about 0.056 mm., length of stigmatic cleft—about 0.044 mm., tubular duct—about 0.023 mm., distance between antennae—about 0.184 mm.

Host.—Actinodaphne mushaensis, attacking the lower side of leaf along the rib and the branch.

Hab.—Kyanrawa, Saukan (Suo-Gun, Taihoku Prefecture).

Many specimens were taken by me on August 15, 1934.

Saissetia bobuae new species.

(Adult female) Pink in life, pinkish brown in dried specimens, shining, laying eggs under the dody, with very little white wax at the stigmatic cleft. Chitinized, hard, oval, broadest about the middle, narrowed on the anterior part, often a little asymmetrical, strongly convex dorsally, gradually sloping to the margin, with an indistinct faint longitudinal narrow median ridge scarcely discernible. Dorsal areolations rather large, as shown in the figure, absent on the marginal narrow area, many distinct circular or oval pores present in an irregular row along the whole margin of the dorsum, which are much smaller than the areolations and variable in size. Stigmatic clefts small, shallow, gradually indented, with 3 spines; the spines long, slender, more or less pointed apically, moderately curved on the distal part, much longer than the marginal setae, reaching beyong the margin; the median spine longer, about twice as long as the shorter, longer than the diameter of dorsal areo-

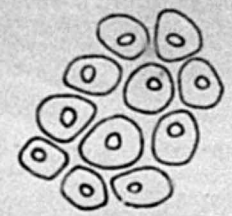

Fig. 2.
Saissetia bobuae new species.
Dorsal areolations of adult female.

lations. Marginal setae short, simple, pointed apically, straight or curved, in a row; those on the hind end much longer; distances between the setae variable, but mostly longer than the setae. Antennae slender, 7-jointed, with some long setae mostly on the distal joints; the 3rd joint longest, a little longer than the 4th, the following joints much longer than wide, the relative length of joints about as follows: I—9, II—10, III—21, IV—15, V—7, VI—7, VII—10. Rostal loop not reaching the middle coxae. Anterior spiracles present laterad of the front coxae; posterior spiracles behind the middle coxae, constricted near the apex, widened towards the base, longer than wide, with some areolations on the basal part; some minute pores present between the spiracle and the cleft. Legs normal, hind coxae large, much longer than wide, hind femora longer than the coxae, as long as the tibiae, about twice as long as the tarsi. Anal plates much longer than wide, rounded distally, on the hind margin and lateral angle, the basal margin a little longer than the hind, nearly straight. Anal ring with 8 stout setae. Venter with numerous small tubular ducts on the submarginal area, 2 pairs of very long fine median bristles in front of the anal opening, some similar bristles between the antennae, many minute circular pores around the genital opening, and some similar pores in a narrow longitudinal group between the hind spiracle and the the genital group of them.

Length of body—about 2.8–3.1 mm., width of body—about 2.2–2.5 mm., length of antenna—about 0.323 mm., marginal seta—about 0.028 mm., caudal cleft including anal plates—about 0.415 mm., anal plate—about 0.111 mm., hind femur—about 0.185 mm., hind tibia—about 0.174 mm., hind tarsus—about 0.092 mm., longer stigmatic spine—about 0.092 mm.

Host.—Bobua (Symplocos) arisanensis, attacking the lower side of leaf and the branch.

Hab.—Kyanrawa (Suo-Gun, Taihoku Prefecture).

Many specimens were collected by me on August 15, 1934. The females are found scattered on the host, but the whitish male scales, which are about 2.2 mm. long, group densely along the midribs of the leaves, and are more numerous than the former. This species is distinguished from the allied species by the pink colour of body.

Paralecanium expansum GREEN, var. **quadrata** GREEN.

Cocc. Ceylon, II, p. 236 (1904).

Host.—Scolopia oldhami.

Hab.—Toran near Taito.

A few specimens were taken by me no May 22, 1934. This variety has been hitherto known from Ceylon and Java. The typical species is common throughout the lowlands of Formosa, attacking a wide range of plants, but is always found in small numbers.

Pulvinaria maxima GREEN.

Ent. Month. Mag., 2nd ser., XV, p. 206 (1904); RAMAKRISHNA AYYAR, Mem. Dept. Agr. India, Ent. Ser., VIII, 12, pp. 127-155 (1925), Imp. Inst. Agr. Res. Pusa, India, Bull. 197, p. 36 (1929).

Pulvinaria thespesiae, GREEN, Cocc. Ceylon, p. 259 (1909); ROBINSON, Philip. Jl. Sc., D, XII, p. 10 (1917); RAMAKRISHNA AYYAR, Imp. Inst. Agr. Res., Pusa, India, Bull., 197, p. 38 (1929); Morrison, Philip. Jl. Sc., XVII, p. 183 (1920); TAKAHASHI, Philip. Jl. Sc., XXXVI, p. 344 (1928); Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 40, p. 61 (1929).

Eriochiton formosae, TAKAHASHI, Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 40, p. 64 (1929).

Hosts.—Morus acidosa, M. sp., Boehmeria sp., B. frutescens, Glochidion spp., Phyllanthus takaoensis.

Hab.—Kappanzan, Shinchiku, Tosei, Hakumo, Kagi,, Kontei near Koshun, Kurarn, Daibu, Taito.

Very common in the south part of Formosa, occurring in abundance. The females have truncate marginal spines, and flattened setae on the anal plates.

Pulvinaria maxima Green is extensively preyed upon by the larvae of a moth probably belonging to *Ephestiella* (Pyralidae), which is among the important checks to the increase of this species. Another species of *Ephestiella** has been found in the colonies of *Pseudococcus filamentosus* CKLL. at Taihoku.

As is well known *Eublemma* (Noctuidae) is an efficient enemy which feeds on scale insects. In Formosa *Eublemma roseonivea* WALK. is by far the most important predator of *Lacifer greeni* CHAM., and *Eublemma* sp. feeds on *Coccus elongatus* SIGNT. in the south part.

Aulacaspis kuzunoi KUWANA, var. **divergens** new variety.

Aulacaspis wakayamensis, TAKAHASHI (nec. KUWANA), Dept. Agr. Gov't. Res. Inst. Formosa, Rept. 40, p. 71 (1929).

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* The larvae of *Ephestiella* spp. are common in the colonies of the aphids, *Oregma* spp., on bamboo in Formosa.

(Adult female) Differs from the typical form described from *Miscanthus* in Japan (Jl. Plant Protect., XIX, p. 98) in the following characters:

(1) Scale larger, about 3.0 mm. long, about 2.0 mm. wide; larval skins at the anterior end of scale, not reaching the center. (2) Body about 1.45 mm. long, about 0.58 mm. wide. (3) Cephalothorax less narrowed towards the front; basal abdominal segment wider than the metathorax. (4) Median lobes distinctly diverging; median sclerotic part at the hind margin of pygidium shorter. (5) Circumgenital pores as follows: the median group with about 16 pores, the upper lateral group with about 28–34 pores, the lower lateral group with about 29 pores. (6) 3rd lobes distinct, somewhat wider than the 2nd, each lobule a little wider than long, rounded apically.

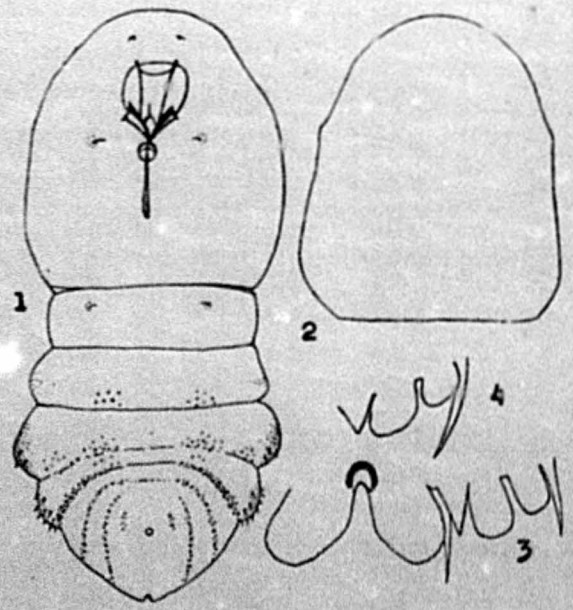

Fig. 3.
Aulacaspis kuzunoi KUWANA, var. *divergens* new variety.
(Adult female)
1. Body.
2. A variety of cephalothorax.
3. Median and 2nd lobes.
4. 3rd lobe.

Scale flattened, slightly convex dorsally, posterior spiracles with many parastigmatic pores; anterior 2 abdominal segments with many dorsal gland orifices, the glands short, stout, slightly longer than wide; basal abdominal segment with a few minute lateral glands, but without spines; 2nd segment with many larger lateral glands, and 2 or 3 gland spines.

Hosts.—Miscanthus spp.

Hab.—Taihoku, Shinten, Byoritsu, Gaishatei, Takeyama, Kanshirei, Funkiko, Botel Tobago.

Very common, but not found on sugar cane and other grasses. Differs from *A. wakayamensis* KUWANA in the characters of median lobes, the slender body, the presence of dorsal glands on the basal abdominal segments, etc. In specimens from Botel Tobago (Kotosho), the basal abdominal segment has more dorsal gland orifices and the 2nd segment with some 8 gland spines on each side.

Aulacaspis wakayamensis KUWANA.

Dept. Finance, Imp. Plant Quar. Serv., Tech. Bull. 4 (Diasp. Cocc. Japan, IV), p. 33 (1926).

Hosts.—Saccharum officinarum, Oplismenus sp., a grass.

Hab.—Tainan, Urai (Taihoku Prefecture).

Many specimens were taken by Mr. M. YANAGIHARA at Tainan on suger cane in February 1927, and some at Urai by me on other hosts in July 1933. New to Formosa. Closely allied to *Aulacaspis tegalensis* ZEHNT., differing, however, in the shape of body. The coccid recorded by me under the name of *A. wakayamensis* KUWANA (Part 1, p. 71) is not this species, but belongs to *Aulacaspis kuzunoi* KUWANA, var. *divergens* TAKAH.

Aulacaspis mangiferae NEWST. var. **aceris** new variety.

(Adult female) (Scale) Pale whitish, semitransparent, subcircular, thin, flattened, about 1.75 mm. long. Larval skins pale yellow, located on the marginal area of the scale.

(Body) Cephalothorax wider than long, a little wider than other segments, well defined, lacking lateral tubercles, with about 5 very small thin lateral glands which are as large as those on the basal abdominal segment. Antennae with a long bristle. Rostal loop short. Spiracles normal in shape, the anterior ones with over 10 parastigmatic pores in some dense groups, the posterior ones with 2 or 3 pores. Metathorax convex laterally, with some 4 very small thin lateral glands; basal abdominal segment convex laterally, with 3 similar lateral glands, without dorsal glands; the following segment distinctly protruding laterally, with some 6 lateral glands and 3 gland spines, without dorsal pores, the glands and spines nearly as large as those on the last segment; the last segment convex laterally, with 5 lateral glands, 5 gland spines and some dorsal glands, the lateral glands much larger than those on the basal segment, but smaller than those on the pygidium, the dorsal glands as large as those on the pygidium, the spines shorter than those on the pygidium.

(Pygidium) Wider than long, with many dorsal longitudinal lines. Anal opening a little nearer to the base than to the distal end, circular. Dorsal gland orifices few, about 4 on each side, laterad of the anal opening, the glands nearly as large as the marginal ones. Marginal glands stout, much longer than wide, 7 on each side. Median lobes in an incision, a little extending out of it, diverging, contigenous at the bases, not sinuate on the margin, rounded apically, much longer than wide,

not notched, minutely serrate; the 2nd lobes distinct, divided, the inner lobules as wide as or slightly wider than long, broadly rounded, not notched, extending inwards, a little larger than and similar in shape to the outer lobules; the 3rd lobes similar to the 2nd. Marginal gland spines normal, 6 or 7 on each side, of which the anterior 2 or 3 are longer. Circumgenital pores in 5 dense groups, the median group with 11 pores, the upper lateral with 22, the lower lateral with 16. Body—about 0.83 mm. long, cephalothorax—about 0.45 mm. wide.

Host.—Acer kawakamii.

Hab.—Budai (Heito-Gun, Takao Prefecture).

A few specimens were taken by me on March 24, 1934. Differs from *Aulacaspis mangiferae* NEWST. on mango in lacking some very small dorsal glands on the metathorax and basal 2 abdominal segments, as well as in the dorsal glands on the pygidium somewhat fewer, and in the colour of larval skins.

Diaspis machilicola new species.

(Adult female) (Scale) White, rather thick, flattened, not convex, subcircular or irregular in shape, about 3.5 mm. long, with many irregular transverse striae on the secretion, the venter closed by a white secretion easily separable from the dorsal secretion. Secretion consists of some very thin layers easily separable. Larval skins pale yellow, on the margin of the scale, the 1st skin extending beyond the margin;

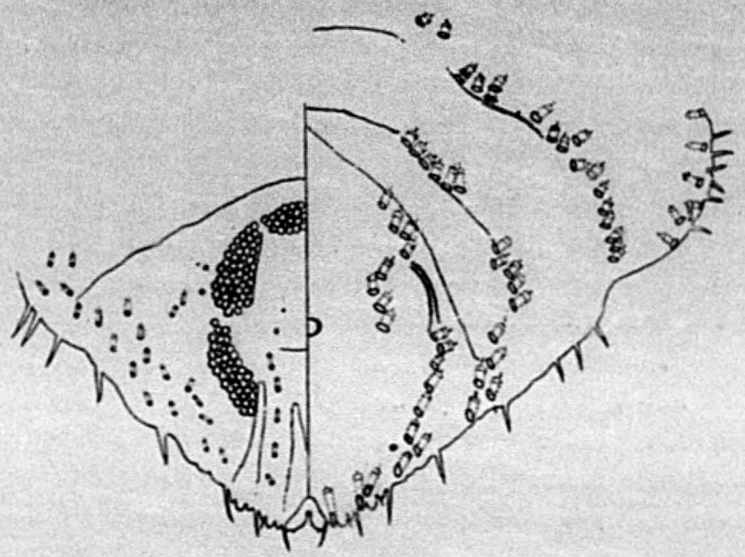

Fig. 4.
Diaspis machilicola new species.
Pygidium of adult female.

the 2nd skin about 1.4 times as long as wide, about 0.75 mm. long, with 7 pairs of gland spines and 5 pairs of marginal glands, of which glands 4 pairs are on the pygidium, the median lobes as in the adult.

(Body) Oblong, broadest on the meso- or metathorax, gradually narrowed towards the pygidium. Head and prothorax fused together, with a few minute lateral glands, with no lateral tubercle. Meso-and metathoraci defined, not convex laterally, with a few minute lateral and ventral grands, without dorsal pores. Basal abdominal segment not or slightly convex laterally, lacking lateral glands and spines, but with 2 or more pairs of dorsal glands as large as those on the posterior segments, and a small oval defined area near the side. The 2nd abdominal segment distinctly protruding and convex laterally, with about 10–14 gland spines, about 10 lateral glands, many dorsal glands and some very small ventral glands. The last segment not protruding laterally, with similar glands and spines. The dorsal and ventral glands on these segments as large as those on the pygidium, but the lateral glands smaller and the gland spines shorter than those on the pygidium. Antennae with a very long bristle. Anterior spiracles with numerous pores in a dense group, the posterior ones with about 10 pores. Body—about 1.5–1.75 mm. long, about 0.9 mm. wide; space between antennae—about 0.079 mm.

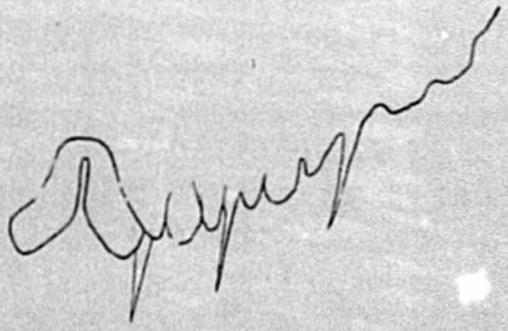

Fig. 5.
Diaspis machilicola new species.
Hind margin of pygidium of adult female.

(Pygidium) Much wider than long, with many eminent longitudinal dorsal lines, sclerotic on the median area of dorsum and on the margin of venter, the dorsal sclerotic area very large. Anal opening rather small, at the center. Dorsal gland orifices numerous, narrowed, arranged as shown in the figure, the glands stout, longer than wide. Venter with many eminent longitudinal lines on the posterior part, and many very small circular gland orifices scattered, the glands slender, shorter than the dorsal ones. Marginal glands as large as or a little

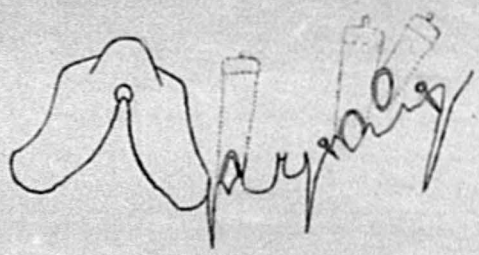

Fig. 6.
Diaspis machili TAKAH.
Hind end of pygidium of adult female.

longer than the dorsal ones, absent at the middle of hind end, 7 on each side. Median lobes in an incision, extending out of it, closely placed, contigenous basally, diverging, longer than wide, not notched, narrowed on the basal part, slightly serrate, rounded apically, very slightly indented on the mesal margin near the apex and more or less pointed apically in some specimens; the 2nd lobes smaller, divided, the inner lobules rounded apically, nearly as long as wide, not or slightly notched, the outer lobules smaller, more or less pointed apically; the 3rd lobes distinct, similar in shape and size to the 2nd. Circumgenital pores in 5 dense groups, the median group with about 38 pores, the upper lateral with about 48, the lower lateral with about 50–55. Gland spines long, about 8–10 on each side.

Host.—Machilus sp., attacking the basal part of stem.

Hab.—Chipponsan (Taito Province).

Some specimens were taken by me on March 23, 1934, on an old host tree. Differs from *Diaspis machili* TAKAH. attacking the leaves of *Machilus* in the lowlands of Formosa in the shape of much smaller median lobes, possessing more ventral glands and more smaller dorsal glands on the pygidium, the presence of dorsal glands on the 2nd abdominal segment, etc.

Diaspis machilicola TAKAH. var. **cinnamomicola** new variety.

(Adult female) Differs from the typical form as follows: (Scale) White, circular, thin, somewhat convex dorsally, without striae on the secretion, about 1.8 mm. in diameter. Larval skins pale brown, at the center of the scale. (Body) Cephalothorax with a short rounded lateral tubercle, which is sometimes absent. (Pygidium) Median lobes scarcely extending beyond the apices of the 2nd lobes, a little smaller, rounded apically, not serrate, not indented on the mesal margin.

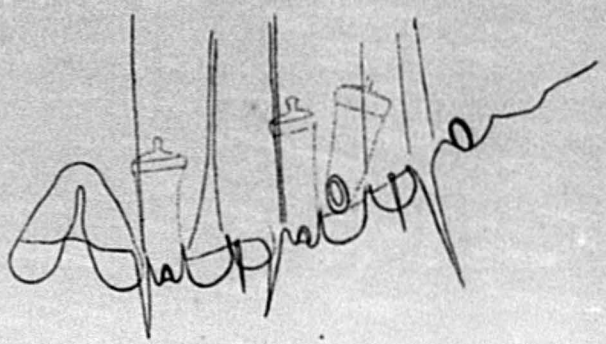

Fig. 7.

Diaspis machilicola TAKAH. var. *cinnamomicola* new variety.

Posterior part of pygidium of adult female.

Host.—Cinnamomum erythrophloia, attacking the leaf and branch.

Hab.—Kussha near Shikikun (Taihoku Prefecture).

Many specimens ware take by me on August 14, 1934.

Phenacaspis rotunda new species.

(Adult female) (Scale) White, thin, not transparent, circular, not convex, about 2.0 mm. in diameter. Larval skins yellow, narrowly brownish on the margin, on the marginal area of the scale, the 1st skin extending beyond the margin. Secretion with no striae and ridges.

(Body) Elongate, about 3 times as long as wide, nearly parallel on the sides, not sclerotic, not widened and with no tubercle on the cephalothorax. Antennae with a long bristle. Anterior spiracles with 6 parastigmatic pores, the posterior ones with 3. Cephalothorax with some very small thin lateral glands; metathorax with 2 lateral glands, of which one is much smaller, the larger one nearly as large

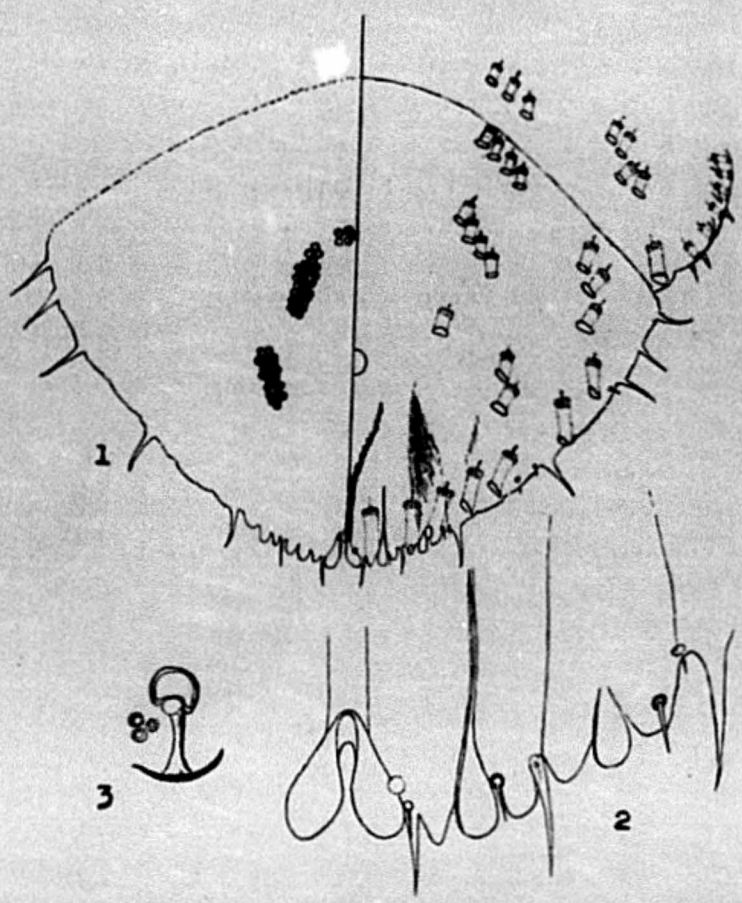

Fig. 8.
Phenacaspis rotunda new species.
(Adult female)
1. Pygidium. 2. Margin of same. 3. Posterior spiracle.

as those on the basal abdominal segment. Abdominal segments convex laterally, not protruding; the basal segment with 6 lateral glands and 1 gland spine; the following segment with 8 lateral glands and 4 gland spines; these 2 segments lacking distinct dorsal glands, but with a few minute glands; the last segment with some 6 gland spines, 7 lateral glands and some dorsal glands, the gland spines much shorter than those on the pygidium, the posterior one of the lateral glands larger, as large as those on the pygidium, the other lateral glands as large as those on the basal segment and much smaller than the dorsal ones, the dorsal glands nearly as large as those on the pygidium. Body—about 1.22 mm. long; space between antennae—about 0.042 mm.

(Pygidium) much wider than long, with many longitudinal dorsal lines. Anal opening a little nearer to the apex than to the base. Dorsal glands much longer than wide, smaller than the marginal ones, distributed as shown in the figure. Marginal glands 7 on each side. Median lobes in an incision, extending out of it, diverging, closely placed, longer than wide, rounded apically, not notched, very slightly serrate, narrowed towards the base on the basal half, nearly parallel on the mesal margins on the basal half; the 2nd lobes distinct, divided, the inner lobules broadly rounded apically, a little longer than wide, not notched, extending inwards, the outer lobules smaller, slightly notched on the outer edge; the 3rd lobes distinct, not divided, nearly as in the inner lobules of the 2nd lobes in shape and size. Gland spines 7 on each side, the posterior 2 of which are much shorter, a little reaching beyond the apices of the median lobes. Circumgenital pores in 5 groups, the median group with 8 pores, the upper lateral with 22-24, the lower lateral with 17. Width of pygidium—about 0.351 mm.

Host.—Quercus pseudomyrsinaefolia.

Hab.—Mutosan (Heito-Gun, Takao Prefecture).

A single specimen was taken by me on March 23, 1934. Related to *Phenacaspis sozanica* TAKAH., but differs remarkably. Lindinger regards the genus *Phenacaspis* COOL. et COCK as a synonym of *Trichomytilus* LEON. (Ent. Anz., XIII, p. 160).

Phenacaspis taiwana new species.

(Adult female) (Scale) Snowy white, flattened, thin, much expanded towards the hind margin, nearly triangular, longer than wide, broadly rounded on the hind margin, about 1.6 mm. long, without striae and ridges on the secretion. Larval skins pale yellow, at the anterior end of the scale; the 2nd skin slightly covered with a secretion, lacking ridges, about twice as long as wide, about 0.785 mm. long, the pygidium with the lobes as in the adult.

(Body) Parallel on the sides or broadest about the middle; mesothorax not defined from the prothorax, but other segments distinct, distinctly convex laterally; no tubercle present on the cephalothorax. Antennae with a very long curved bristle. Anterior spiracles with 2 parastigmatic pores, but the posterior ones wanting them. Mouth parts rather large. Metathorax with about 5 lateral glands a little smaller than those on the abdominal segments. Abdominal segments with some 6 or 7 lateral glands much smaller than the dorsal ones, and a few short gland spines; the last 2 segments with a much larger lateral gland at the hind end and some dorsal similar glands in transverse rows; the dorsal glands as large as those on the pygidium. Body—about 0.83 mm. long, about 0.36 mm. wide.

(Pygidium) Slightly wider than long, not more sclerotic than other parts of body, with many longitudinal dorsal lines. Anal opening somewhat nearer to the base than to the apex, nearly equal in diameter to the dorsal gland orifices. Dorsal gland orifices oval, rathe large, in 2 rows (2 or 3+3 or 4 in each row), the glands mostly wider than long, stout, shorter than the marginal ones. Marginal glands longer than wide, stout, 7 on each side. Median lobes as in *P. quercus* KUWANA, but rather roughly serrate on the mesal side, with a pair of eminent setae between them; the 2nd lobes divided, the inner lobules much longer than wide, broadly rounded apically, slightly narrowed basally, not reaching the apices of median lobes; the outer lobules pointed apically, conical, much shorter than the inner ones; the 3rd lobes absent. Gland spines a little extending beyond the apices of median lobes; about 7 on each side, the anterior ones shorter. Circumgenital pores in 5 groups, the median group with 6 pores, the upper lateral with 16 or 17, the lower lateral with 13–19. Genital opening located under the anal opening. 4 long marginal setae present on each side.

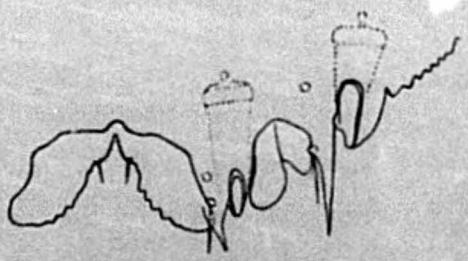

Fig. 9.
Phenacaspis taiwana new species.
Adult female.
Posterior part of pygidium.

Host.—Quercus sp., attacking the lower side of leaf along the rib.

Hab.—Kinyan (Suo-Gun, Taihoku Prefecture).

Some specimens were taken by me on August 16, 1934. Closely related to *Phenacaspis quercus* KUWANA, but differs as follows: Larval skins pale yellow, with no ridge on the 2nd skin; mouth parts larger, with a longer rostal loop; anterior spiracles with 2 pores; mesothorax not defined from the prothorax; pygidium

narrower, nearly as long as wide, with fewer dorsal gland orifices and circum-genital pores (dorsal gland orifices some 5 or 6 in each row), with no median gland; genital opening under the anus; median lobes distinctly serrate on the mesal side, somewhat narrower on the distal part, the inner lobules of the 2nd lobes broadly rounded apically, slightly narrowed basally, slender; a few minute circular pores present on the venter of pygidium; body narrower. Differs from *Phenacaspis chinensis* CKLL. in wanting the 3rd lobes, and is easily separated from other species of the genus in Formosa by the characters of the median lobes.

Leucodiaspis vitis new species.

(Adult female) (Scale) The 1st skin black, twice ae long as wide, on the front margin of the 2nd, about 0.42 mm. long. The 2nd skin brownish black, long, a little curved, gradually narrowed on the anterior part, abruptly so on the posterior part, convex dorsally, with no ridge, about 1.25 mm. long, with a few small lateral glands, and some 10 short stout processes in a row on each side in front of the pygidium; the processes truncate, widened towards the base, a little wider than long, each with a small slender gland; segmentation distinct especially on the posterior part; pygidium rounded, wanting thickened areas on the dorsum, with 2 pairs of eminent lobes, many wide fimbriated plates and gland orifices; the lobes broadly rounded on the distal margin, nearly as long as wide, scarcely notched, not serrate, parallel, extending inwards, the median lobes somewhat larger; the fimbriated plates wider than long, as long as the lobes, 2 between the median lobes, and also between the median and 2nd lobes, about 8 outside of the 2nd on each side; the marginal glands stout, short, a little longer than wide, 6 on each side, and a median one also present, the orifices enlarged, sclerotic on the margin; 2 similar dorsal glands present near the hind margin on each side; anal opening circular, at the center.

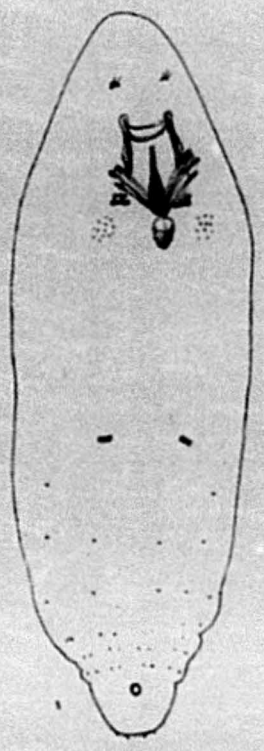

Fig. 10.
Leucodiaspis vitis new species.
Body of adult female (Rostal loop not shown).

(Body) Elongate, narrowed on both ends, wanting lateral processes and glands, faintly reticulated on the median area of venter (from the mouth parts to behind the posterior spiracles), with the segmentation not dis-

cernible; a pair of groups of glands present near the mouth parts, each group consisting of about 10 glands which are very small and longer than wide; abdominal segments with some minute setae arranged in transverse rows. Antennae with 3 long bristles. Anterior spiracles with about 5 parastigmatic pores, but the posterior ones wanting them. Body—about 0.83 mm. long.

(Pygidium) Nearly as long as wide, rounded, small, with 9 dorsal sclerotic areas, of which the median one is very large, surrounding the anal opening. Anal

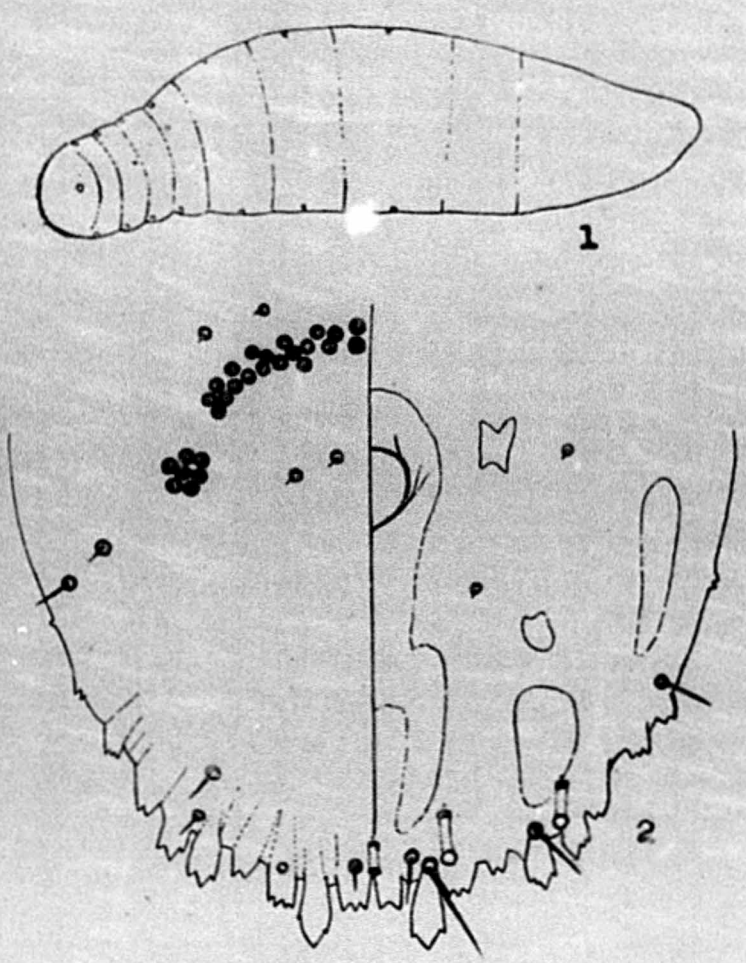

Fig. 11.

Leucodiaspis vitis new species.

1. 2nd skin (marginal processes not shown).
2. Pygidium of adult female.

opening large, longer than wide, nearer to the base than to the apex. Marginal gland orifices small, circular, 2 on each side, and a median one also present; the

glands slender. Median lobes eminent, distinctly longer than wide, pointed apically, notched on each side, somewhat narrowed towards the base, parallel, widely separated; the 2nd lobes nearly similar in shape to the median but smaller. Plates short, wide, with 2 or 3 pointed apical processes, 2 between the median lobes, and also between the median and the 2nd, about 5 outside of the 2nd, of which the anterior one is rudimentary. Some bristles present on the margin, of which the posterior one is much longer. Circumgenital pores in 5 proups, but the upper 3 groups confluent.

(Male scale) Elongate, about 4 times as long as wide, not narrowed on the posterior part, convex dorsally, with no ridge, about 1.2 mm. in length, black on the 1st skin, but white on the remaining part.

Host.—Vitis sp., attacking the leaf.

Hab.—Takao.

Some specimens were collected by me on March 26, 1934. This species is characterized by the eminent median lobes of the pygidium. Related to *Leucodiaspis cordylinidis* MASK. The male scales are more common than the females.

Lepidosaphes tokionis KUWANA.

Proc. Calif. Acad. Sc., 3, III, p. 81 (1902); Dept. Finance, Imp. Plant Quar. Serv., Tech. Bull. 2 (Diasp. Cocc. Japan. II), p. 42 (1925).

Host.—Codiaeum variegatum.

Hab.—Heito (Takao Prefecture).

Many specimens were found by me on May 29, 1932. New to Formosa. The description by Kuwana is very brief, and now I adopt this name tentatively. Closely allied to *L. lasianthi* GREEN known to attack croton in Ceylon and Philippine, and may be identical with it, but differs from Green's description of that species in possessing a very short, but distinct, median process at the hind end of pygidium. In the adult female, the mesothorax has some lateral glands, the metathorax with many lateral glands, and same short conical gland spines in a transverse group on the submarginal area on each side; the abdominal segments moderately produced

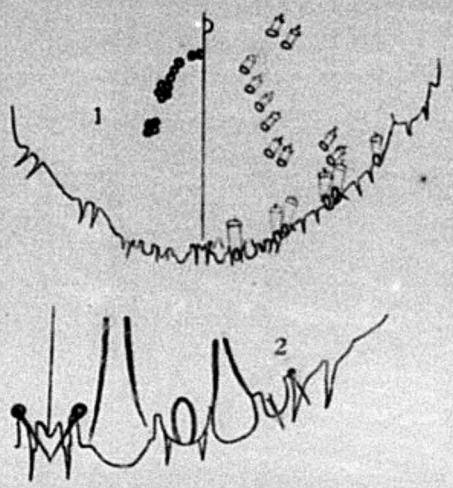

Fig. 12.
Lepidosaphes tokionis KUWANA.
(Adult female)
1. Pygidium.
2. Hind part of pygidium.

laterally, with many lateral glands, the basal segment with many short conical gland spines, but other segments with 2 or 3 gland spines; the lateral glands of the body are a little smaller than the dorsal ones on the pygidium; and the 2nd skin is about twice as long as wide and about 0.7 mm. in length.

Lepidosaphes bladhiae TAKAHASHI.

Jl. Soc. Tropic. Agr. Formosa, III, 4, p. 379 (1931).

Lepidosaphes kamakurensis, TAKAHASHI (nec. KUWANA), Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 40, p. 75 (1929).

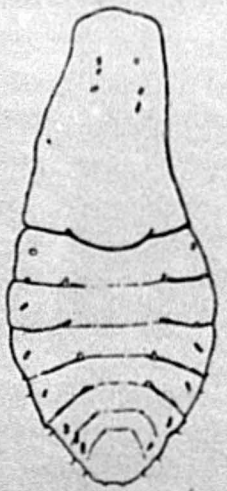

Fig. 13.
Lepidosaphes bladhiae TAKAH.
2nd larval skin.

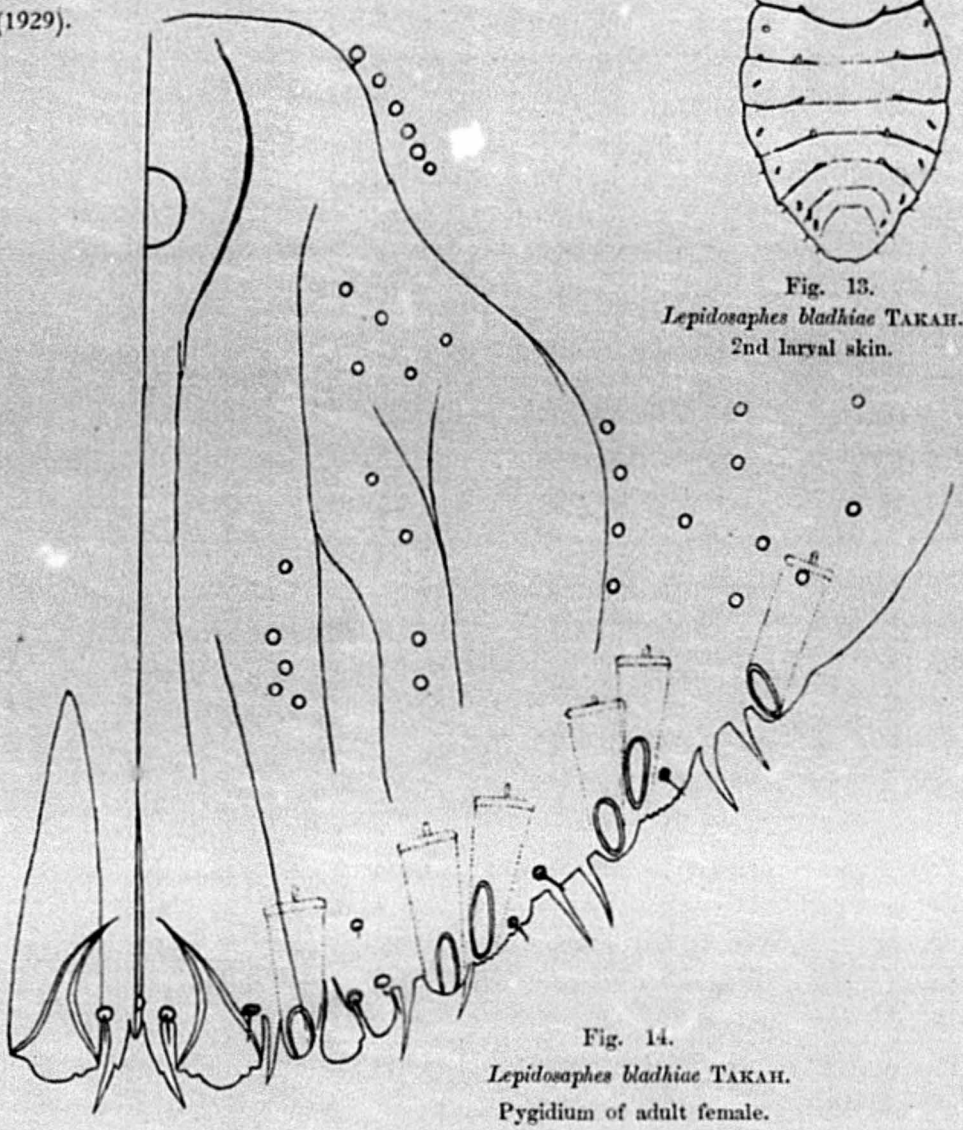

Fig. 14.
Lepidosaphes bladhiae TAKAH.
Pygidium of adult female.

(Adult female) The 2nd skin rather narrow, with some irregular transculent areas. Body slender, broadest on the basal part of abdomen; head with numerous minute spinules; thorax and abdomen with many thin lateral glands; basal abdominal segment with many short conical gland spines in a large group on each side, the last 3 abdominal segments with a lateral spur and 3-6 gland spines. Median lobes usually twice notched on each side; lobules of the 2nd lobes sometimes notched on the out side. Dorsal gland orifices also present on the lateral part of pygidium, the glands thin, not so long. Other characters given in the original description.

Hosts.—Bladhia spp. (Ardisia spp.), Agalma lutchuense, Illicium anisatum, Vitis sp., Maesa sp., Heterosmilax joponica.

Hab.– Taihoku, Shinten, Shirin, Rimogan near Urai (Taihoku Prefecture), Taiheizan, Kagi, Kanshirei, Suisha, [illegible]ito, Garambi, Toran near Taito.

Very common, sometimes occurring in abundance.

Lepidosaphes takaoensis new species.

(Adult female) (Scale) Yellowish brown, a little covered with white secretions. Very wide, broadest about the middle, narrowed towards the front end, very slightly more than twice as long as wide, curved, distinctly convex dorsally, with no ridge, about 1.5 mm. in length. The 1st skin slightly extending beyond the front end of the 2nd, slightly concave at the middle of front, with a pair of distinct marginal glands on the front, about 0.38 mm. long. The 2nd skin wide, about 1.6 times as long as wide, narrowed on the anterior part, with distinct segmentation, about 0.6 mm. long, with 4 very short, but distinct, stout conical spines and some longer normal gland spines on each side, the pygidium with 3 pairs of stout marginal glands and the median lobes

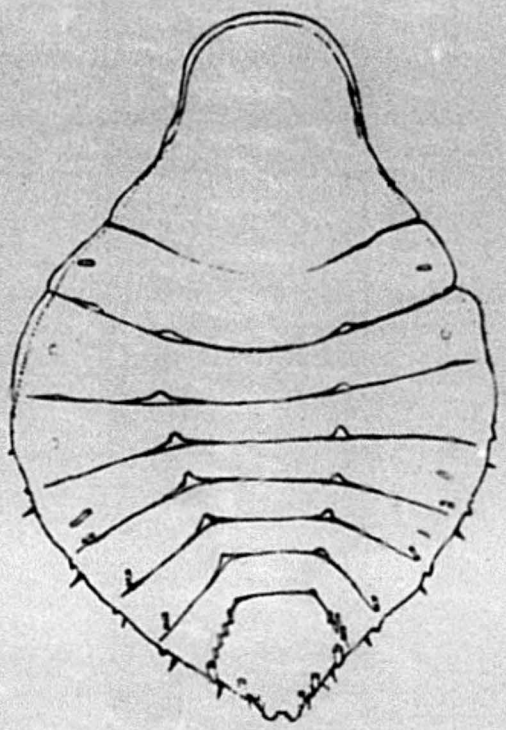

Fig. 15.
Lepidosaphes takaoensis new species.
2nd larval skin.

nearly as in the adult, but more eminently notched.

(Body) Wide, broadest on the metathorax or basal abdominal segment, narrowed on the anterior part, with some very small glands in a group behind the antennae, which are smaller than the thoracic lateral ones. Each thoracic segment not convex laterally, a little defined, with small glands in a group on each side, the glands few on the prothorax, but numerous on the other segments; some 3 very short conical spines present mesad of the group of lateral glands on the meso- and metathoraci. Abdominal segments defined, the basal segment lightly convex laterally, with many lateral glands and 5 or 6 short conical gland spines; the posterior 3 segments distinctly protruding laterally, w a distinct spur on each side, many lateral glands and 3–6 gland spines, the gland spines on the last segment as long as those on the pygidium, the glands as large as those on the thorax and pygidium. Antennae with 2 or 3 long curved bristles. Anterior spiracles with 2–4 parastigmatic pores, but the posterior ones wanting them. Body—about 0.98 mm. long, about 0.51 mm. wide, space between antennae—about 0.046 mm.

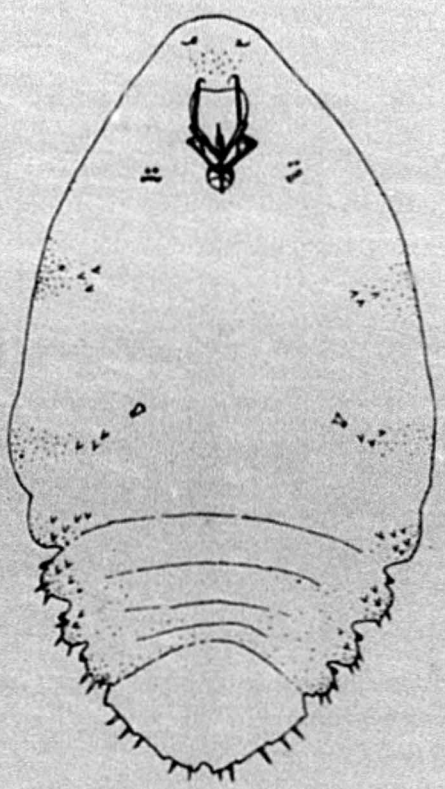

Fig. 16.
Lepidosaphes takaoensis new species.
Body of adult female.

(Pygidium) Much wider than long, notched at the hind end, sclerotic on the median area of dorsum and the posterior margin, with many longitudinal dorsal lines and a blunt protuberance on each side near the base. Anal opening nearer to the base than to the apex. Dorsal gland orifices small, circular or oval, numerous, sclerotic on the margin, the glands very slender. Marginal glands stout, longer than wide, as long as the dorsal ones, 3–5 on each side. Median lobes large, stout, slightly shorter than wide, widely separated, parallel, broadly rounded apically, once or twice notched on each side near the distal margin; the 2nd lobes small, bilobed, the inner lobules a little longer than wide, rounded apically, not notched, the outer lobules much smaller, a little widened basally, somewhat pointed apically, narrow; the 3rd lobes absent. Gland spines

long, slender, longer than the median lobes, about 7 on each side. Circumgenital pores in 5 groups, the median group with 5 or 6 pores, the upper lateral with 7–9, the lower lateral with 2–7.

Host.—Celtis sinensis, attacking the leaf.

Hab.—Takao Kotobukiyama).

Many specimens were taken by me March 26, 1934. Related to *Lepidosaphes cycadicola* KUWANA, differing, however, in the wider scale and the median lobes

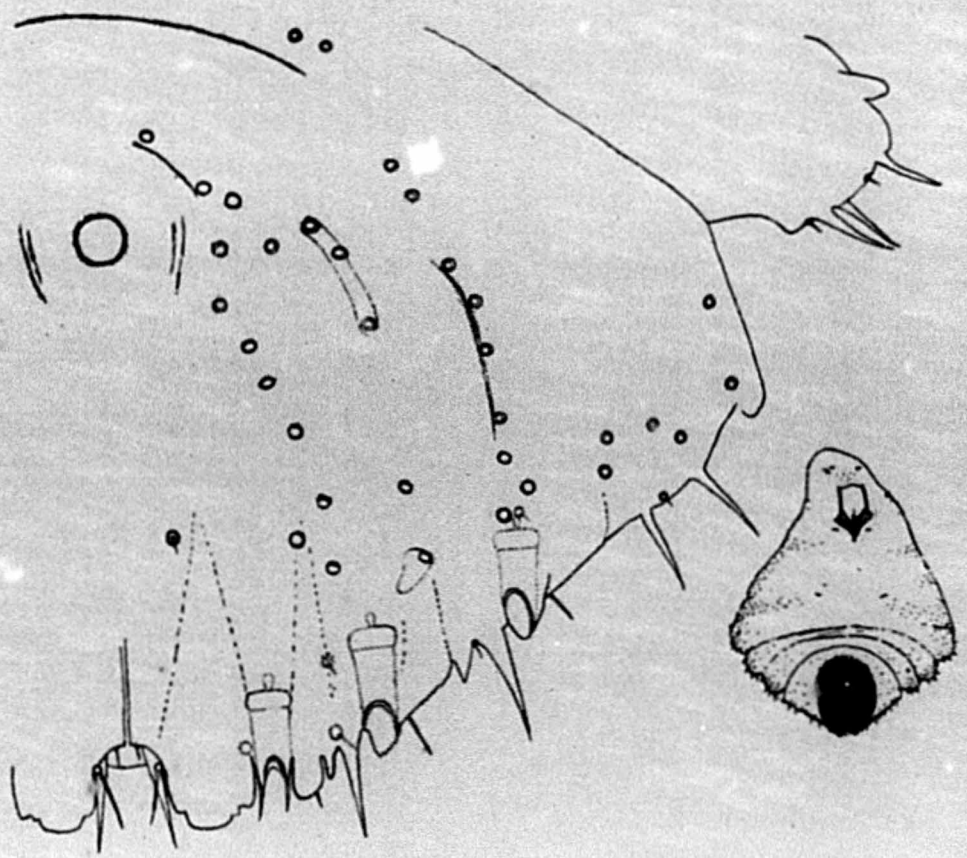

Fig. 17.

Lepidosaphes takaoensis new species.

Adult female (body) and its pygidium.

more widely separated. Differs from *L. celtis* KUWANA in the wider scale, the median lobes notched twice on either side, etc. and from *L. conchyformis* GMEL. and *L. pinnaeformis* BOUCHÉ remarkably.

Lepidosaphes cycadicola KUWANA, var. **yamahoi** new variety.

(Adult female) (Scale) Brownish black, elongate, a little broadened towards the posterior part, straight or curved, convex dorsally, about 3 mm. long, about 1.1 mm. wide. Larval skins yellowish brown or dark brownish, the 2nd skin wide, with a distinct transverse furrow, many small transculent areas, and 3 longitudinal broad indistinct stripes on the abdomen, about 0.81 mm. long, about 0.49 mm. wide, the pygidium with 4 pairs of marginal glands, the median lobes large, wider than long, the 2nd lobes very small, divided, each lobule longer than wide.

(Body) Stout, widened posteriorly, with many minute lateral glands on the thorax.

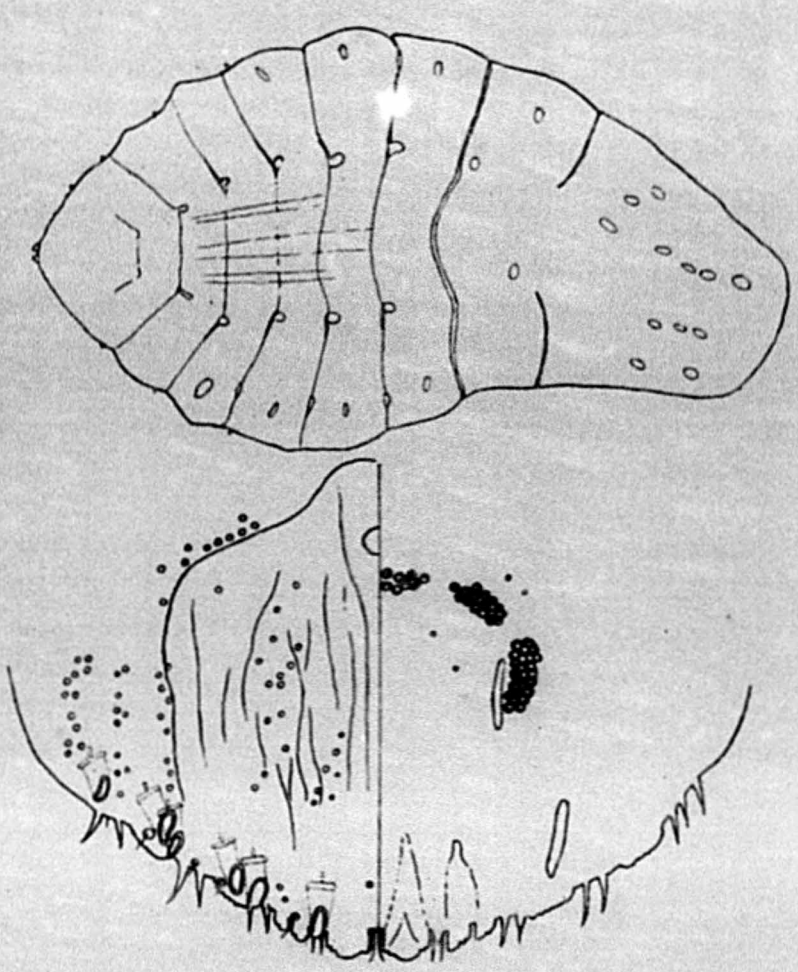

Fig. 18.

Lepidosaphes cycadicola KUWANA, var. *yamahoi* new variety.
2nd larval skin and pygidium of adult female.

Abdominal segments distinctly protruding laterally, with many minute glands, the basal segment less protruding laterally, with some 10 short conical lateral spines; the following 3 segments with some 6 or 7 long gland spines and a distinct pointed sclerotic spur on each side; the gland spines slightly knobbed apically, somewhat larger than those on the pygidium. Antennae with 2 curved bristles. Anterior spiracles with some 7 parastigmatic pores usually in 2 groups, the posterior ones without them. Body—about 1.2 mm. long.

(Pygidium) Much wider than long, sclerotic on the median area of dorsum, with many stout longitudinal lines on the dorsum. Anal opening much nearer to the base than to the apex. Dorsal gland orifices very small, nearly circular, somewhat variable in size, not arranged in rows, deposited as shown in the figure; the glands thin. Median lobes large, protruding, closely placed, parallel, wider than long, broadly rounded apically, notched once or sometimes twice on the mesal side and usually twice on the lateral side near the apex; the 2nd lobes small, divided, the lobules usually wider than long, the inner ones once or twice notched on the lateral side, the outer lobules shorter, once notched on the lateral side, sometimes pointed apically. Marginal glands stout, longer than wide, 6 on each side. Circumgenital pores in 5 groups, the median group with some 9 pores, the upper lateral with some 15–21, the lower lateral with some 14. Gland spines a little longer than the median lobes, 7 on each side, and a pair also present between the median lobes. Venter with 2 pairs of short longitudinal sclerotic areas; a wide sclerotic area running from each lobe, which is longer than the lobe.

Host.—A shrub not determined, attacking the twig.

Hab.—Heito (Takao Prefecture).

Many specimens were collected by Mr. R. Yamano on May 28, 1932. Differs from Kuwana's description and figures of the typical form as follows: Scale wider, brownish black; abdominal segments with more gland spines and the last 3 segments with a lateral spur; antennae with 2 bristles; parastigmatic pores more in number; dorsal gland orifices differ in distribution on the pygidium, the glands shorter; circumgenital pores more in number.

Fiorinia rhododendri new species.

(Adult female) (Scale) Elongate, pale in colour, beneath the epidermis on the lower side of the leaf. The 2nd skin without eminent lateral spines, about 1.2 mm. long, the pygidium with 5 pairs of stout marginal glands and 2 pairs of lobes, the median lobes similar in shape to those of the adult, but a little diverging, slightly pointed apically; the 2nd lobes small, divided, the inner lobules rounded apically,

notched on the outer edge, the outer lobules pointed apically, not notched.

(Body) Elongate, with a few very small pointed gland spines on the side. Antennae near the front end, not very closely placed, lacking long processes, with a long bristle. Frontal process between the antennae minute, smaller than the antennae, pointed, with some small pointed spines. Anterior spiracles with about 3 parastigmatic pores, the posterior ones wanting them. Abdominal segments not produced laterally, the last segment with a small pointed gland spine, the penultimate segment with 2 similar spines; the spines a little larger than those on the anterior part of body. Body—about 1.0 mm. long.

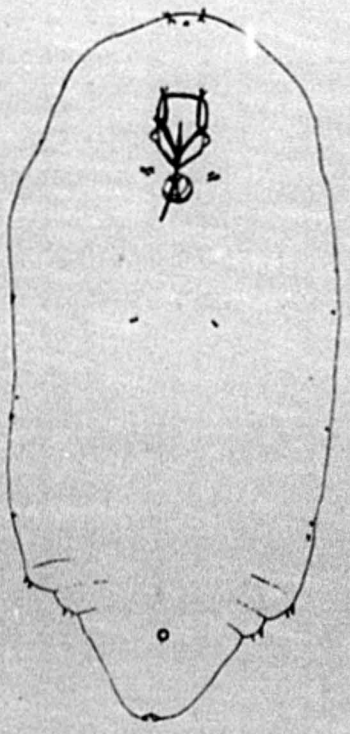

Fig. 19.
Fiorinia rhododendri new species.
Body of adult female.

(Pygidium) Wider than long, with many longitudinal dorsal and ventral lines. Anal opening nearer to the base. Marginal glands rather large, much longer than wide, 3 or 4 on each side, some small slender submarginal glands also present. Median lobes large, stout, in an incision, but distinctly extending out of it, rounded on the distal margin, scarcely notched, serrate, closely placed, parallel; the 2nd lobes very small, divided, the inner lobules wider than long, rounded apically, as shown in the figure, the outer lobules nearly similar to the inner, but a little smaller. Gland spines short, pointed, 2 on each side. Some marginal bristles present as shown in the figure. Circumgenital pores in 5 groups, the median group with 4 pores, the upper lateral with about 11 or 12, the lower lateral with about 17–19. Some 5 very small setigerous pores present in front of the genital opening; 2 similar pores also laterad of the upper lateral group of circumgenital pores.

Host.—Rhododendron sp., attacking the lower side of leaf.

Hab.—Chipponsan (Taito Province).

4 specimens were taken by me on March 23, 1934. Near to *Fiorinia horii* KUWANA, but differs in the elongate body, the median lobes closely placed, the fewer marginal glands, the presence of the 2nd lobes, etc. The interantennal tuber-

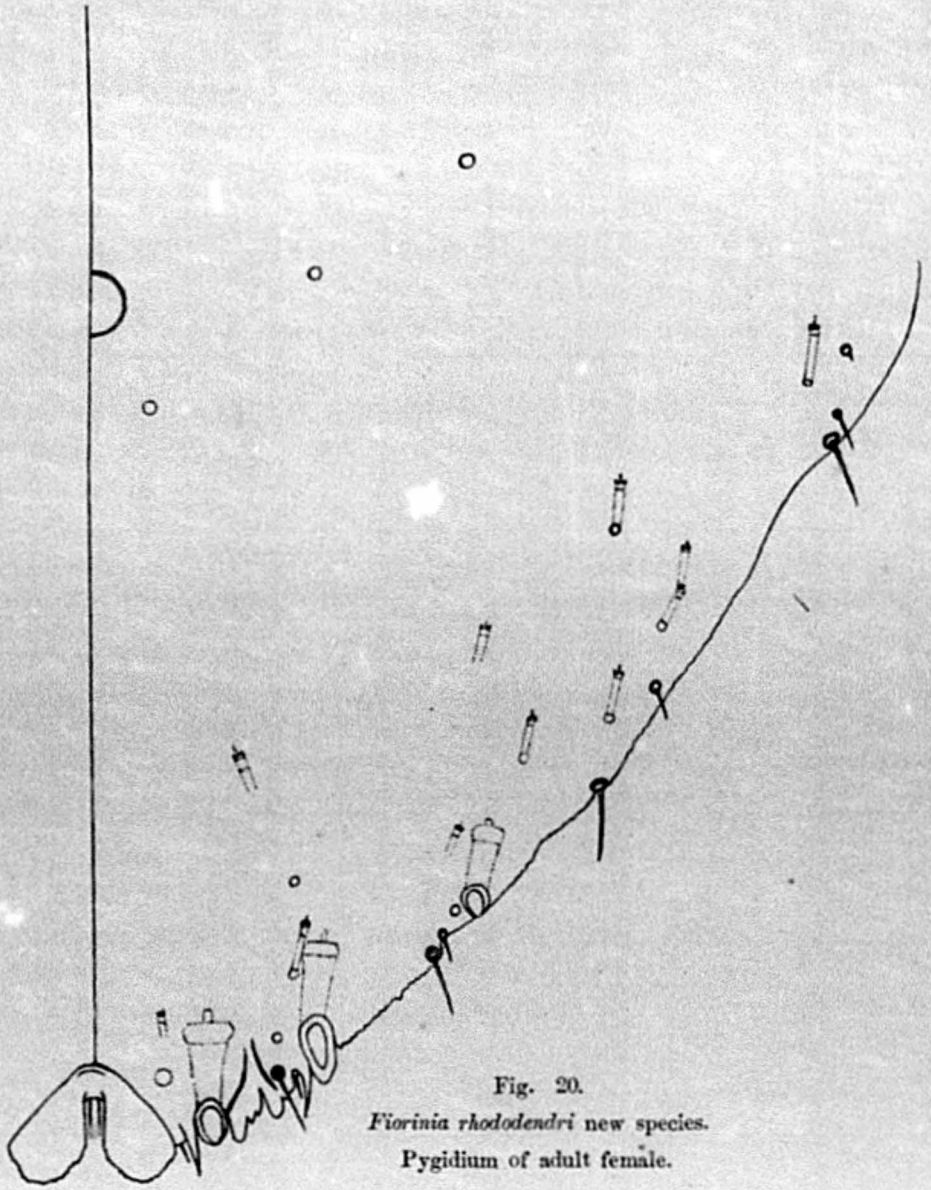

Fig. 20.
Fiorinia rhododendri new species.
Pygidium of adult female.

cle resembles that of *F. saprosmae* GREEN, and the median lobes have markings through the whole length.

Parlatoria lithocarpi new species.

(Adult female) (Scale) Nearly circular, scarcely convex dorsally, beneath the epidermis on the lower side of leaf. The 1st skin oval, slightly indented at the anterior extremity and also behind the eye, extending beyond the front margin of

the 2nd, with a pair of setae at the front, and a pair of large lobes at the hind end, about 0.32 mm. long; the antennae 5-jointed, the basal 4 joints very short, with some long bristles, the last joint long, with a very long apical bristle. The 2nd skin pale, transculent, yellowish on the margin, nearly circular, slightly longer than wide, somewhat narrowed on the anterior part, without spines, about 0.58 mm. long, the pygidium small, a little protruding, broadly rounded, with 3 pairs of lobes and 3 pairs of marginal glands, both nearly similar to those of the adult.

(Body) Wide, a little narrowed on the anterior part, with many small lateral glands on the metathorax and abdomen, which are as large as those on the basal part of pygidium and fewer on the metathorax. Abdominal segments not protruding

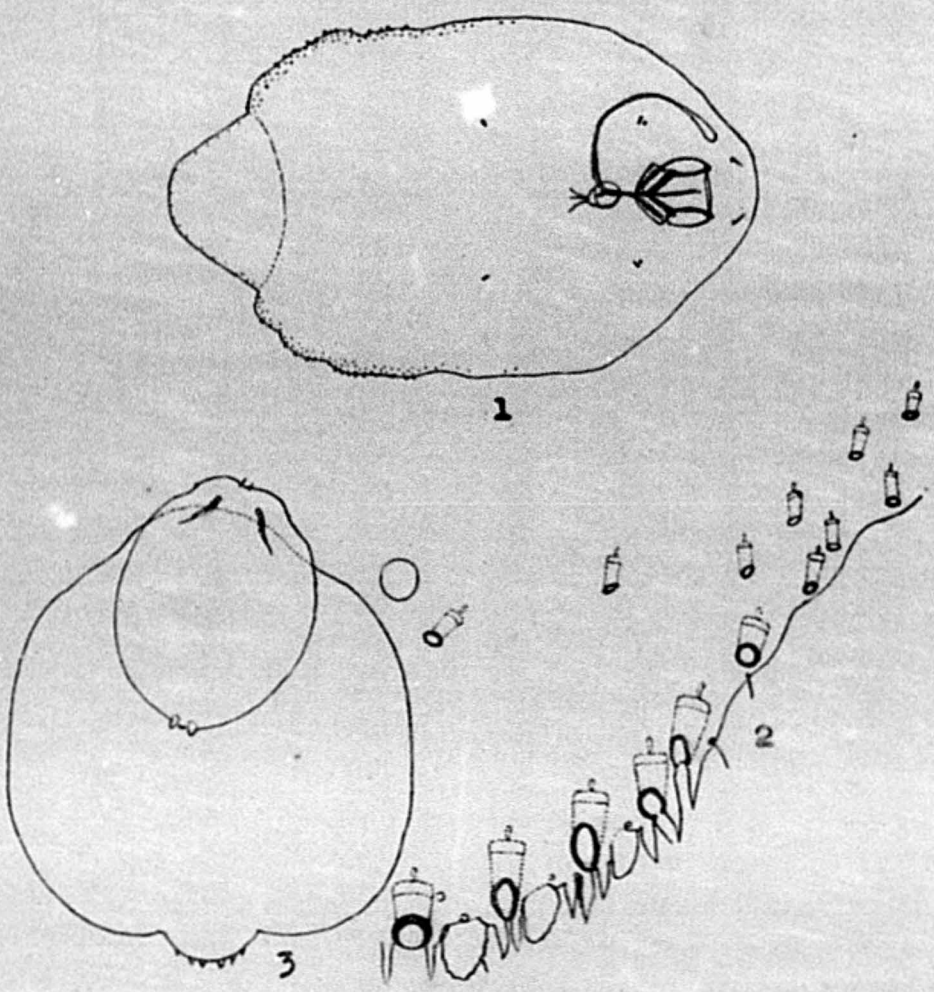

Fig. 21.
Parlatoria lithocarpi new species.
1. Body of adult female. 2. Pygidium of same. 3. Larval skins.

laterally, with some very small, short, conical lateral spines. Antennae with a long bristle. Anterior spiracles with a parastigmatic pore, the posterior ones without it.

(Pygidium) Much wider than long, with many longitudinal dorsal lines. Anal opening nearly at the center. Dorsal gland orifices few, arranged as shown in the figure, the glands longer than wide, nearly as large as the anterior marginal ones. Marginal glands about 8 on each side, of which the anterior 4 are much smaller, the posterior ones large, stout, longer than wide, nearly as long as the median lobes; a median gland also present. Lobes large, eminent, 3 on each side, the median lobes as long as or slightly longer than wide, serrate, not notched, rounded distally, parallel, widely separated; the 2nd lobes a little smaller than the median, serrate except on the straight mesal side, rounded apically, longer than wide; the 3rd lobes similar in shape to, but a little smaller than, the 2nd. Circumgenital pores in 4 groups, the upper group with 6 or 7 pores in a row, the lower with 5. Genital opening much nearer to the base than to the apex. Gland spines pointed, not fimbriated, rather slender, nearly as long as the median lobes, 2 between the median lobes and also between the median and the 2nd, 3 between the 2nd and the 3rd and also outside of the 3rd.

Host.—Lithocarpus sp., attacking the lower side of leaf.

Hab—Mutosan (Heito-Gun, Takao Prefecture).

Some specimens were taken by me on March 23, 1934. They were loosely scattered on the leaves. Apparently different from other species in the characters of pygidium and in the peculiar shape of the 2nd skin.

Neoparlatoria lithocarpi TAKAH.

Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 63, p. 28 (1934).

This species was regarded to be identical with *Apteronidia uberifera* LINDINGER by LINDINGER (Ent. Anz., XIV, p. 37), but differs remarkably from it in the characters of the 2nd skin as follows: (Pygidium) The lobes narrowed towards the tip, not notched, serrate, more or less pointed apically; the median lobes closely placed; the gland spines slender, pointed apically, serrate on the side; the marginal glands variable in number from 4–6 on each side.

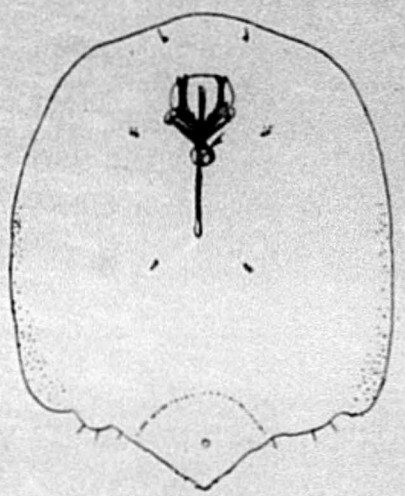

Fig. 22.
Neoparlatoria lithocarpi TAKAH.
Body of adult female.

Many adult females were found beneath the epidermis on the lower surface of the leaves of Lithocarpus sp. at Mutosan, Heito-Gun, Takao Prefecture, in March 1934. In these specimens the pygidium is wanting marginal glands, with the lobes serrate.

Aspidiotus shakunagi new species.

(Adult female) (Scale) Pale whitish, thin, slightly convex dorsally, nearly circular, semitransparent, beneath the epidermis on the lower side of leaf, about 0.8 mm. in diameter. Larval skins pale yellow.

(Body) Normal in shape, with some rather long submarginal setae, without lateral spines and glands. Thorax and abdomen not well defined, abdominal segments not protruding laterally, with no lateral glands. Antennae widely separated, with a very long curved bristle. Mouth parts large, rostal loop very long. Spiracles rather stout, without parastigmatic pores. Body—about 0.63 mm. long, distance between antennae—about 0.1 mm.

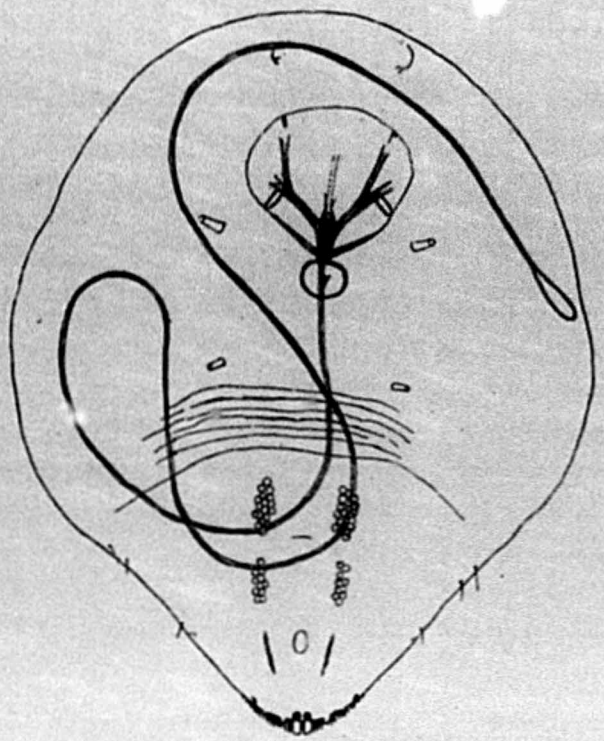

Fig. 23.
Aspidiotus shakunagi new species.
Body of adult female.

(Pygidium) Large, wider than long, with thin longitudinal ventral lines, a pair of longitudinal ventral sclerotic areas and a somewhat sclerotic part on each margin outside of the last lobe. Anal opening oval, much nearer to the apex than to the base. Dorsal gland orifices transversely oval, not arranged in rows, about 7 on each side on the posterior part; the glands long, filiform, reaching the lower groups of circumgenital pores, but not the genital opening, about 12 on each side. Median lobes large, protruding, slightly longer than wide, notched on either side, broadly rounded apically, slightly concave on the mesal side, but slightly rounded

on the lateral side, parallel, very closely placed; the 2nd lobes small, nearly as long as wide, notched on the lateral side, rounded apically; the 3rd subequal in size to, or smaller than, the 2nd, similar in shape to the 2nd. A stout sclerotic area running foreward from the base of each median lobe, which is shorter than the lobe. A pair

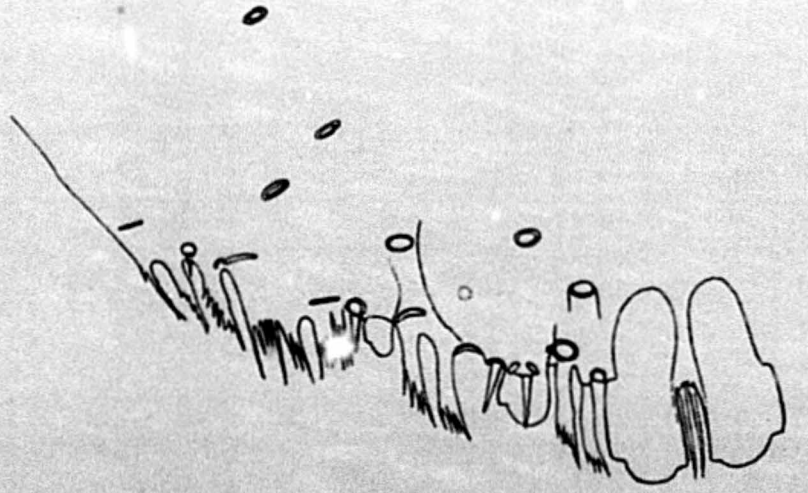

Fig. 24.
Aspidiotus shakunagi new species.
Pygidium of adult female.

of very slender pointed simple plates present between the median lobes, 2 slender fimbriated plates between the median and 2nd lobes, and also between the 2nd and 3rd, some 6 fimbriated plates outside of the last lobes; the fimbriated plates deeply fimbriated, nearly as long as the median lobes. Circumgenital pores in 4 groups, the upper group with about 14–16 pores, the lower with 10 or 11. Some long stout spines present on the margin, which are much longer than the 2nd lobes.

Host.—Rhododendron sp. (shakunagi).

Hab.—Chipponsan (Taito Province).

Some specimens were collected by me on March 23, 1934. Characterized by the very long rostal loop.

Aspidiotus chipponsanensis new species.

(Adult female) (Scale) Whitish, thick, convex dorsally, about 1.6 mm. in diameter, usually beneath the epidermis of the host. Larval skins pale yellowish.

(Body) Normal in shape, wanting lateral spines, with some filiform lateral glands on the thorax and abdomen, which are much shorter than those on the pygidium. Antennae very widely separated, with 2 very long bristles and a few short stout pro-

cesses. Spiracles without parastigmatic pores, much expanded basally. Mouth parts small. Abdominal segments somewhat convex laterally. Body—about 1.15 mm. long.

(Pygidium) Much wider than long, with many eminent stout longitudinal dorsal lines except on the median area, 4 transverse sclerotic areas on the basal part of

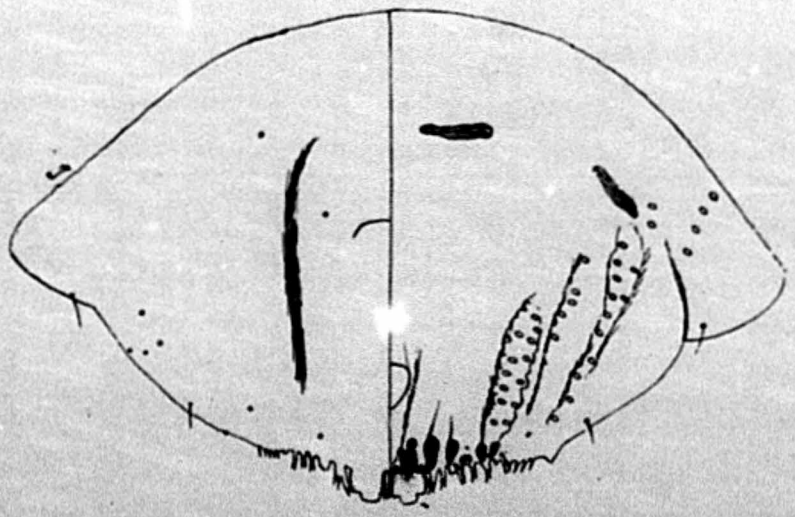

Fig. 25.
Aspidiotus chipponsanensis new species.
Pygidium of adult female.

dorsum and a pair of long longitudinal sclerotic areas on the venter. Anal opening oval, pointed posteriorly, much nearer to the apex than to the base. Dorsal gland orifices oval, arranged in rows, small, numerous, surrounded with corrugations; the glands long, filiform, a few of them reaching beyond the basal margin. Median lobes large, a little wider than long, protruding, eminently notched on each side, rounded apically and on the lateral side, parallel, closely placed; the 2nd lobes very small, wider than long, more or less pointed apically; the 3rd rudimentary. A pair of very thin fimbriated plates between the median lobes not reaching the apices of the lobes; 2 slender fimbriated plates between the median and 2nd lobes, some 3 similar plates between the 2nd and 3rd, some 3–5 rather short simple pointed plates outside of the last lobes. Circumgenital pores absent. Some stout spines present along the margin, which are much longer than the 2nd lobes. Some 5 short stout indistinct paraphyse-like sclerotic areas also present on each side.

Host.—Rhododendron sp. (shakunagi), attacking the branch.

Hab.—Chipponsan (Taito Province).

A few specimens were taken by me on March 23, 1934. In some specimens the

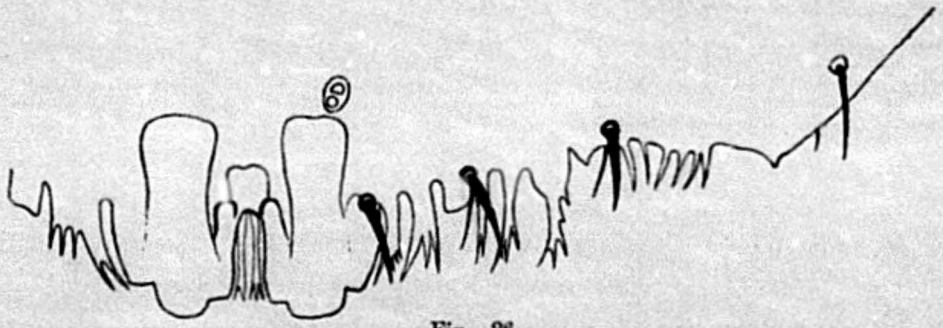

Fig. 26.

Aspidiotus chipponanensis new species.
Posterior part of pygidium of adult female.

2nd lobes are not pointed apically, with the sides not notched. Allied to *Aspidiotus camelliae* SIGNT., but differs in possessing many long filiform glands. At Sozan, Formosa, *Rhododendron* is commonly attacked by *Aspidiotus excisus* GREEN on the leaves, but not by the species herein described.

Aonidia tentaculata GREEN, var. **formosana** new variety.

(Adult female) (Scale) Yellowish brown, shining, with a large longitudinal black patch at the median part, flattened, smooth. The 2nd skin sclerotic, but paler on the posterior extremity, rounded on the anterior half, gradually tapering on the posterior half, 1.6 times as long as wide, sometimes widely, but very shallowly, constricted on the basal part of the posterior half, with a very narrow, but distinct, marginal border, and many narrow longitudinal paler parts on the median area mostly of the posterior half, about 1.63 mm. long; the pygidium with 3 pairs of small narrow lobes which are equal in size and shape, parallel, rounded apically, and slightly notched on the lateral side, the median lobes very closely placed, the 4th lobes rudimentary; 2

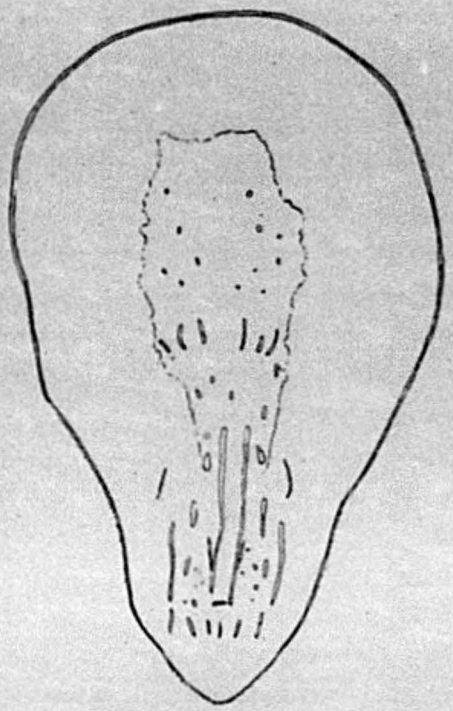

Fig. 27.

Aonidia tentaculata GREEN, var. *formosana* new variety.
2nd larval skin.

fimbriated plates present between the median and 2nd lobes, and also between the 2nd and 3rd, 3 plates between the 3rd and 4th; some 8 larger plates or processes outside of the last lobes rounded and serrate on the lateral side, fimbriated, but not deeply, on the apex, similar in outline to those of the typical form; 3 pairs of large long tubular glands and some pairs of smaller similar glands also present.

(Body) As in the typical form in shape, with numerous short conical gland spines in a row on the posterior part of thorax and the abdomen, which are abruptly narrowed on the distal half. Antennae widely separated, with a very long stout seta scarcely curved. Parastigmatic pores absent. Body including pygidium—about 0.8 mm. long.

(Pygidium) Abruptly projecting, about 1.2 times as long as wide, similar to that of the typical form, but somewhat narrower and very slightly or scarcely constricted just in front of the foremost processes. 2 circular sclerotic parts present at the apex of each process.

Host.—Cinnamomum sp., attacking the upper surface of leaf.

Hab.—Habon near Musha.

4 specimens were taken by me on August 10, 1934. Differs from the typical from in the shape of the 2nd skin and its structures, as well as in the somewhat narrower pygidium of adult female. The typical from is known from Vateria indica in India (Rec. Ind. Mus., XVI, p. 440), but is not found in Formosa.

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ALEYRODIDAE OF FORMOSA. IV.

By

Ryoichi TAKAHASHI.

Introduction.

In the present paper are dealt with 16 species and 2 varieties new to science and another 2 species not heretofore recorded as occurring in Formosa, which I have encountered in the course of my work during the past year and a half.

It is noteworthy that *Dialeurodes citri* ASHM. has been found on a native citrus growing wild in the mountainous regions in the island, and several species have been found for the first time on mulberry, peach, persimmon (*Diospyros kaki*) and other cultivated plants.

The present report is the last of this series of papers, and the results of my further studies will be published under different titles in other periodicals.

New food plants of the Formosan Aleyrodidae.

Acer kawakamii (Aceraceae).

Taiwanaleyrodes meliosmae TAKAH.

Actinodaphne sp. (Lauraceae).

Dialeurodes subrotunda TAKAH.

Tuberaleyrodes machili Takah., var. actinodaphnis TAKAH.

Agalma taiwanianum (Araliaceae).

Dialeurodes agalmae TAKAH.

Bischofia javanica (Euphorbiaceae).

Aleurotrachelus caerulescens SINGH.

Bladhia sp. (Myrsinaceae).

Aleurotuberculatus jasmini TAKAH.

A. suishanus TAKAH.

Dialeurodes ardisiae TAKAH.

Bridelia monoica (Euphorbiaceae).

Dialeurodes hibisci KOTINS.

Cinnamomum sp. (Lauraceae).

Tuberaleyrodes machili TAKAH., var. actinodaphnis TAKAH.

Citrus aurantium, var. tachibana (Rutaceae).

Dialeurodes citri ASHM.

Damnacanthus indicus, var. formosanus (Rubiaceae).

Pealius damnacanthi TAKAH.

Daphniphyllum membranaceum (Euphorbiaceae).

Dialeurodes daphniphylli TAKAH.

Diospyros kaki (Ebenaceae).

Aleurotrachelus turpiniae TAKAH.

Dialeurodes citri ASHM.

Elaeagnus formosana (Elaeagnaceae).

Dialeurodes elaeagni TAKAH.

Eugenia sp. (Myrtaceae).

Dialeurodes bladhiae TAKAH.

Ficus rigida (Moraceae).

Aleurotuberculatus ficicola TAKAH.

Dialeurodes ficicola TAKAH,

Ficus swinhoei.

Aleuroplatus fici TAKAH.

Dialeurodes fici TAKAH.

Hedera formosana (Araliaceae).

Aleurolobus hederae TAKAH.

Lindera oldhami (Lauraceae).

Aleurotrachelus tuberculata SINGH.

Tuberaleyrodes machili TAKAH.

Machilus sp. (Lauraceae).

Dialeurodes subrotunda TAKAH.

Pealius machili TAKAH.

Taiwanaleyrodes indica SINGH.

Maesa sp. (Myrsinaceae).

Aleurotuberculatus jasmini TAKAH.

A. uraianus TAKAH.

Morus alba (Moraceae).

Aleurotuberculatus ficicola TAKAH.

A. psidii Singh.

Dialeuropora setigera TAKAH.

Oreocnide pedinculata (Urticaceae).

Aleurotrachelus elatostemae TAKAH.

Aleurotuberculatus multipori TAKAH.

Piper sp. (Piperaceae).

Aleurotuberculatus uraianus TAKAH.

Psychotria serpens (Rubiaceae).

Pealius psychotriae TAKAH.

Prunus persica (Rosaceae).

Bemisia myricae KUWANA.

Pyracantha koidzumi (Rosaceae).

Aleurotrachelus pyracanthae TAKAH.

Rhododendron sp. (Ericaceae).

Aleurotuberculatus rhododendri TAKAH.

Rubus sp. (Rosaceae).

Dialeuropora setigera TAKAH.

Scolopia oldhami (Flacourtiaceae).

Aleurolobus setigerus QUAINT. et BAKER.

Solanum sp. (Solanaceae).

Aleurotrachelus elatostemae TAKAH.

Tetradenia sp. (Lauraceae).

Tuberaleyrodes machili TAKAH.

Tristylium ochnaceum (Camelliaceae).

Dialeurodes tristylii TAKAH.

Vanieria cochinchinensis (Moraceae).

Dialeurodes vanieriae TAKAH.

Viburnum awabucki (Caprifoliaceae).

Dialeurodes bladhiae TAKAH.

New or little-known Formosan Aleyrodidae.

Dialeurodes subrotunda new species.

(Pupa case) Pale brown or pale yellowish brown, darker on the median area, with no secretion. Nearly circular, a little longer than wide, not constricted, depressed, not indented at the hind end. Mid-thoracic suture nearly reaching the margin; transverse suture* not so; abdominal segments distinct. 26 very long, a

* Suture between the thorax and abdomen.

little curved, dorsal setae arranged in a row along the whole margin, each arising from a small tubercle, of which 2 near the hind end are a little shorter; a pair of rather short setae present on each of the pro- and mesothoracic and basal abdominal segments and also near the vasiform orifice; dorsum densely with numerous small

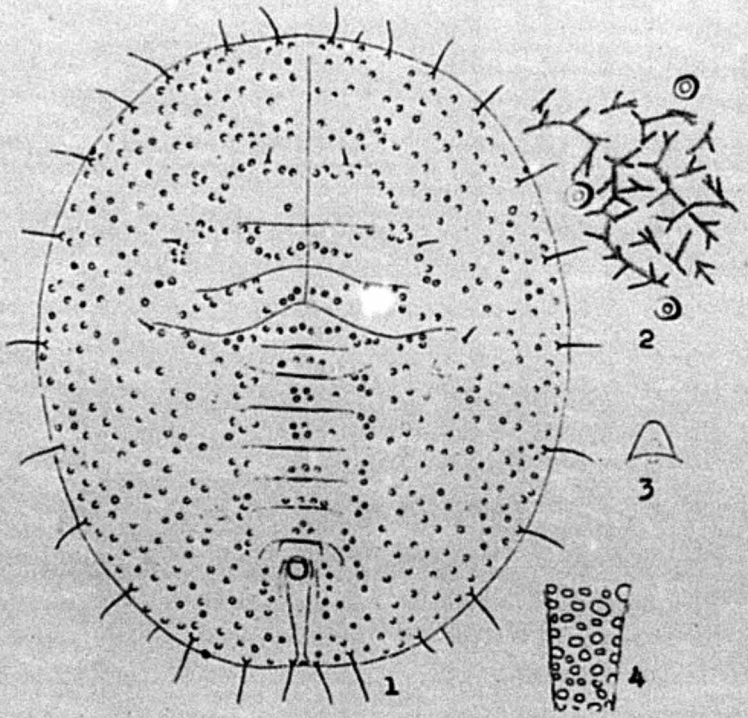

Fig. 28.

Dialeurodes subrotunda new species.

(Pupa case)

1. Dorsal view.
2. Dorsal markings and papillae.
3. Dorsal papilla (lateral view).
4. Sculptures in caudal furrow.

markings as shown in the figure over the whole surface except on the median area, and many rather large sclerotic papillae scattered over the surface, which are much fewer than the markings, nearly as large as or slightly smaller than the basal tubercles of submarginal setae, rounded apically, nearly as wide as or wider than long, narrowed towards the tip, conical, and each with a somewhat transparent circular area at the center. Marginal teeth very small, rounded distally, much wider than long; 2 pairs of usual marginal setae rather long. Thoracic tracheal folds without markings and dots, not distinct, the distal end sclerotic, small, not forming a distinct pore. Caudal furrow distinct, rather wide, a little widened

towards the base, as wide as the vasiform orifice at the base, not thickened on the lateral margin, with numerous distinct rather large or small polygonal sculptures more or less in transverse rows on the whole length; the distal end sclerotic, not forming a distinct pore. Vasiform orifice rather small, rounded, nearly as long as wide, thickened on the margin, not notched, without teeth, the anterior margin expanded. Operculum wider than long, rounded laterally, truncate and slightly indented on the hind margin, filling the orifice. Lingula slender, sometimes reaching beyond the hind end of the orifice. Antennae short, with an apical process. Length of pupa case—about 2.2 mm., caudal furrow—about 0.254 mm.

Hosts.—Machilus sp., Actinodaphne sp.

Hab.—Mutosan (Heito-Gun, Takao Prefecture), Chipponsan (Taito Province) (altitude about 1600 meters).

Numerous pupa cases were observed and collected by me on March 22 and 23, 1934. This species is characterized by the presence of eminent dorsal papillae and the very long setae arranged in a row along the margin. Somewhat resembles *Dialeurodes spina* Singh, but differs remarkably.

Dialeurodes citri Ashm., var. **kinyana** new variety.

(Pupa case) White, with a large longitudinal black patch on the median area of dorsum, which is hardly reaching the 8 th abdominal segment, interrupted by a broad transverse pale area between the head and thorax, wider than half the breadth of abdomen, and gradually becoming paler on the border. Other characters as in the typical form. Pupa case—about 1.57 mm. long, about 1.27 mm. wide, distance between vasiform orifice and hind end—about 0.222 mm., vasiform orifice including margin—about 0.055 mm. long, about 0.067 mm. wide.

Host.—Unknown.

Hab.—Kinyan (Suo-Gun, Taihoku Prefecture).

A single specimen was taken by me on August 16, 1934. Differs from the typical form in possessing a large black dorsal patch, and from *Dialeurodes kirkaldyi* Kotin. in the larger black patch, the vasiform orifice with irregular short teeth and a median tooth, the thoracic tracheal pores with some teeth, and the cephalothorax not so constricted.

In March 1934 I had the opportunity of examining the wild citrus, *Citrus aurantium*, var. *tachibana* in a wild forest at Mutosan (altitude about 1455 meters), Heito-Gun, Takao Prefecture. The Citrus far isolated from the cultivated ones was found to be attacked by some pupa cases of *Dialeurodes citri* Ashm., *Fiorinia theae* Green, a species of Cercopidae, etc. *D. citri* Ashm. is found on various plants

indigenous to Formosa, and seems to be native to the island, though some might have been introduced on cultivated plants.

Dialeurodes agalmae new species.

(Pupa case) White, with no secretion. Broadly elliptic, broadest on the basal part of abdomen, about 1.25 times as long as wide, very slightly constricted behind the thoracic tracheal pores, not indented at the hind end, flattened, thin. Mid-thoracic suture indistinct, reaching the margin; transverse suture indistinct laterally, not reaching the margin; abdominal segments distinct. Dorsum with numerous small rounded papillae densely scattered except on the marginal narrow area and on the median part; cephalothorax with many similar papillae on the marginal parts of thoracic segments on the median area; abdominal segments with some smaller papillae along the mar as; meso- and metanota and abdominal segments with a pair of indistinct markings on the anterior part; a pair of small rounded tubercles present on the prothorax and basal abdominal segment, which are sclerotic and much larger than the dorsal papillae, and the pair on the abdomen a little larger; a pair of short setae present near the vasiform orifice. Margin thin, similar to that of *D. citri* Ashm., with 2 pairs of usual setae rather long. Thoracic tracheal folds distinct, slender, gradually widened basally, with many minute dots; the pores within the margin, entirely closed, small, oval, with 2 or 3 small distinct teeth which are more or less pointed or rounded apically, wider than long, nearly triangular and on the mesal side. Caudal furrow absent, the pore nearly as in the thoracic ones; ventral caudal fold distinct, wide, wider than the vasiform orifice, much expanded anteriorly, with many minute dots. Vasiform orifice small, thickened on the margin, wider than long, rounded on the lateral and hind margins, with about 4 pairs of short pointed teeth and a larger rounded median tooth, the front margin expanded. Operculum much wider than long, indented on the hind margin, occupying nearly half or more the orifice. Lingula exposed, slender, reaching the hind margin of the orifice. Pupa case—about 1.6–1.7 mm. long, vasiform orifice including margin—about 0.064 mm. long, about 0.06 mm. wide, distance between vasiform orifice and hind end—about 0.224 mm.

Host.—Agalma taiwanianum.

Hab.—Kyanrawa near Muroruafu (Suo-Gun, Taihoku Prefecture).

Numerous specimens were taken by me on August 15, 1934. Closely allied to *D. citri* Ashm., but differs in the presence of distinct teeth in the thoracic tracheal pores and possessing numerous dorsal papillae. The papillae are similar to those of *Dialeurodes formosensis* Takah. (Part II, p. 10).

Dialeurodes elaeagni new species.

(Pupa case) White, with no secretion. Elliptic, broadest about the middle, not constricted, not indented at the hind end, flattened, thin. Mid-thoracic and transverse sutures not reaching the margin; abdominal segments distinct. Dorsum with 30 rather long thin setae arranged in a row along the whole margin, which are a little capitate, straight or slightly curved, subequal in length, reaching beyond the margin and each arising from a small tubercle; a pair of short capitate setae present on the cephalothorax, near the vasiform orifice and also between the vasiform orifice and hind end; many short small rounded papillae scattered except on the median and marginal narrow areas; some rather large eminent rounded papillae present on the lateral parts of thoracic and basal 6 abdominal segments; 1–3 similar papillae also at the middle of the basal 3 abdominal segments. Margin thin, crenate, with the usual marginal setae somewhat shorter than the submarginal setae. Thoracic tracheal folds distinct, without dots; the clefts small, widely opening, as shown in the figure. Caudal furrow distinct, long, expanded basally, somewhat thickened on the lateral margin of the posterior part, with many small, but distinct, rounded papilla-like markings on the whole length, which are arranged in transverse rows on the basal part; the distal cleft distinct, shallow, widely opening, with

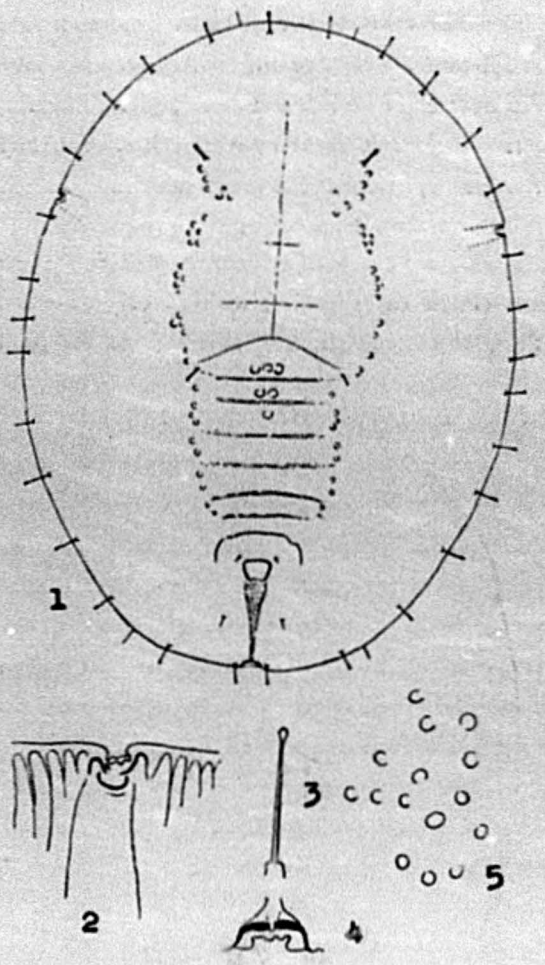

Fig. 29.

Dialeurodes elaeagni new species.

(Pupa case)

1. Dorsal view. 2. Thoracic tracheal fold and cleft. 3. Submarginal seta. 4. Distal end of caudal furrow. 5. Dorsal papillae.

some 3 very short rounded teeth. Vasiform orifice wider than long, nearly trapezoidal, without teeth. Operculum longer than wide, subcordate, rounded distally, nearly filling the orifice. Lingula not exposed. Pupa case—about 1.25 mm. long, about 0.97 mm. wide, vasiform orifice—about 0.046 mm. long, caudal furrow excluding cleft—about 0.16 mm., submarginal seta—about 0.028 mm.

Host.—Elaeagnus formosana.

Hab.—Chippon near Taito, Keiko (Karenko).

Some specimens were taken by me on March 29 and May 21, 1934. Closely allied to *D. fici* TAKAH., but differs in the positions of longer submarginal setae, the characters of rracheal pores, etc. Much resembles *Trialeurodes bicolor* SINGH, but possesses thoracic tracheal clefts. The larva of this species has some parts on the venter, from which many long lines are radiating.

Dialeurodes vanieriae new species.

(Pupa case) White, without evident secretions. Elliptic, not constricted, very thin, sometimes slightly indented at the hind end. Mid-thoracic and transverse sutures not reaching the margin; abdominal segment distinct. Dorsum with 24 rather short thin capitate setae arranged in a row along the whole margin, which are variable in length and the anterior 6 are usually longer, reaching the margin; a pair of very short capitate setae present on the cephalothorax, basal abdominal segment, near the vasiform orifice and near the hind end; many lines running mesad from the margin, many linear markings present on the submarginal area, peculiar markings on the median area and the lateral parts of it; rhachis absent; some short small rounded papillae sparsely scattered on the dorsum except on the median and marginal areas, which

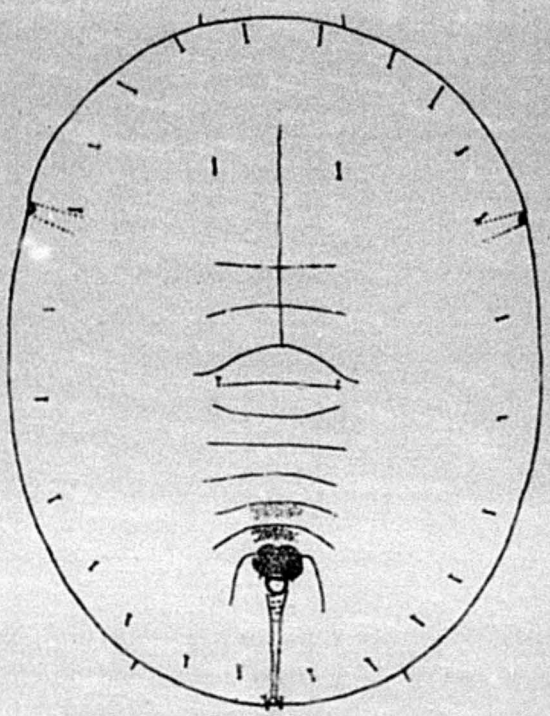

Fig. 30.
Dialeurodes vanieriae new species.
(Pupa case)

are indistinct in some specimens. Margin crenate, the usual setae normal. Thoracic tracheal folds faintly discernible, without dots and markings; the pores small, within the margin, nearly closed, wanting teeth. Caudal furrow distinct, long, narrow, expanded basally, without distinct markings, but with faint indistinct sculptures or a few transverse linear sculptures on the basal part; the pore as in the thoracic tracheal ones. Vasiform orifice small, subcordate, as long as wide, without teeth; the front marginal area expanded, not well defined. Operculum much wider than long, truncate on the hind end, filling most of the orifice. Lingula slightly exposed. Pupa case-about 1.38 mm., vasiform orifice excluding front margin-about 0.037 mm., caudal furrow excluding pore—about 0.194 mm.

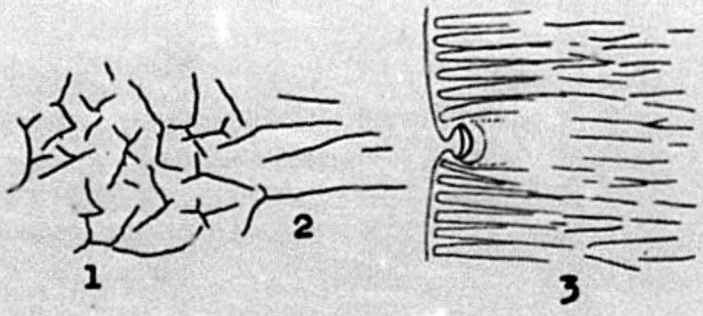

Fig. 31.
Dialeurodes vanieriae new species.
(Pupa case)
1. Markings on lateral part of dorsal median area.
2. Markings on dorsal median area.
3. Thoracic tracheal pore and submarginal markings.

Host.—Vanieria cochinchinensis.

Hab.—Botan (Koshun-Gun, Takao Prefecture).

Some specimens were taken by me on May 25, 1934. Differs from *D. fici* Takah. in the fewer dorsal papillae and the caudal furrow without distinct markings, and from *D. pallida* Singh in the characters of caudal furrow, etc.

Dialeurodes ficicola new species.

(Pupa case) White, with no secretion evident. Obovate, narrowed on the posterior part, not constricted, flattened, thin, a little indented at the hind end. Mid-thoracic suture not distinct; transverse suture not reaching the margin; abdominal segments faintly discernible. Submarginal area very broad, not separated from the dorsal disk, but defined, with many linear markings running towards the margin. Dorsum with some rounded papillae as shown in the figure. Marginal teeth very small, rounded, much wider than long; anterior marginal setae long,

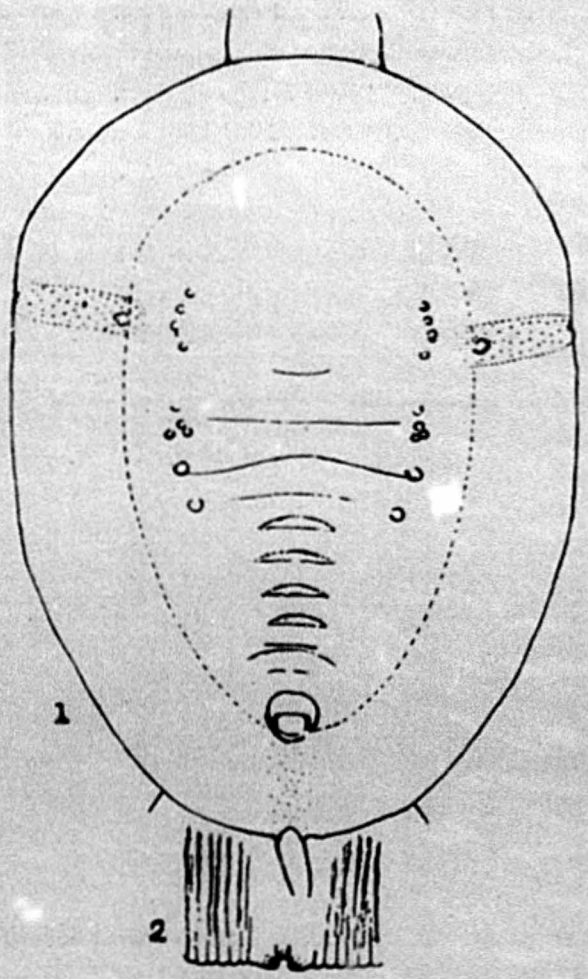

Fig. 32.
Dialeurodes ficicola new species.
(Pupa case)
1. Dorsal view.
2. Thoracic tracheal pore and submarginal area.

each arising from a small tubercle, posterior marginal setae normal; a pair of long setae present at the hind end, each of which arises from a small tubercle. Thoracic tracheal folds distinct, with many small dots; the pores very small, widely opening, wanting teeth, sclerotic on the margin. Caudal furrow absent. Ventral caudal fold not distinct, with very small dots. Vasiform orifice large, wider than long, not notched, wanting teeth, the anterior marginal area much dilated. Operculum much wider than long, occupying most of the orifice. Lingula not exposed. Pupa case—about 0.66 mm. long, about 0.48 mm. wide.

Host.—Ficus rigida.

Hab.—Mizuho (Karenko Province).

A single incomplete specimen was taken by me on May 21, 1934. Differs from other species in the submarginal area defined. Related to *Dialeurodes* (*Gigaleurodes*) *simmondi* CORBETT, but different from it remarkably.

Dialeurodes tristylii new species.

(Pupa case) In dried specimens pale yellowish brown, thoracic tracheal folds not dark, no secretion evident. Circular, slightly longer than wide, not constricted, not indented at the hind end, flattened. Mid.thoracic suture reaching the margin;

suture between the meso-and metanota eminent, straight; transverse suture eminent, not reaching the margin; abdominal segments distinct; rhachis absent. Thinner transparent areas present on the dorsum as shown in the figure, which are membraneous and scarcely stained with fuchsin. Dorsum lacking papillae and setae, but with many very long thin straight suture-like lines running mesad from the margin, some minute circular pores sparsely scattered, and reticulations laterad of the dorsal disk; no setae discernible near the vasiform orifice. Margin crenate. 30 teeth occupy about 0.46 mm., usual marginal setae short; a pair of short somewhat capitate setae present on the front margin. Thoracic tracheal folds distinct, broad, a little widened towards the base, with numerous small, but distinct, polygonal sculptures densely over the whole length; the sculptures much elongated on the distal part; the pores distinct, small, completely closed, distinctly separated from the margin, with about 12 eminent teeth which are longer than wide and rounded apically. Caudal furrow distinct, as broad as the orifice, long, not widend towards the base, reaching the anterior margin of the orifice, not well defined laterally, with sculptures similar to those of the thoracic tracheal folds, which are present along the side of the orifice; the pore as in the thoracic ones. Vasiform orifice small, rounded, not notched, wanting teeth, thickened on the margin, as long as wide, the anterior marginal area widened. Operculum much wider

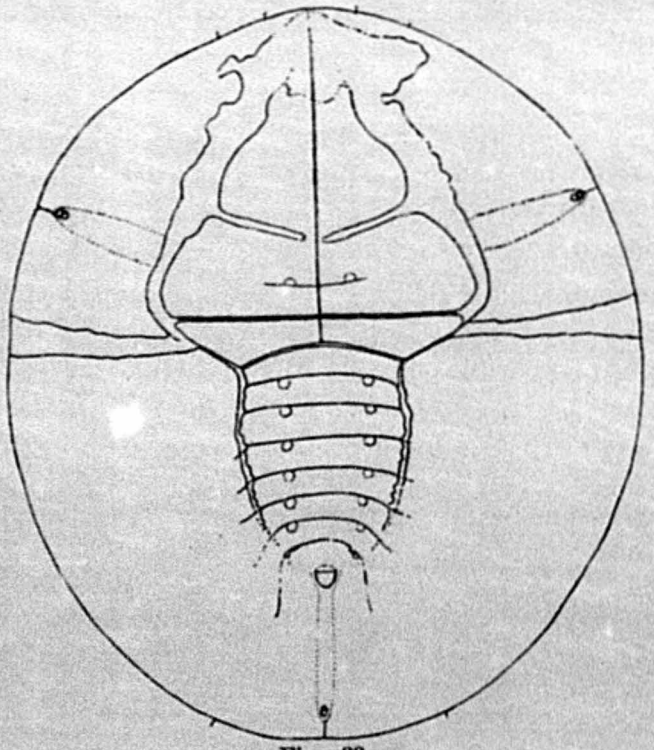

Fig. 33.
Dialeurodes tristylii new species.
(Pupa case)

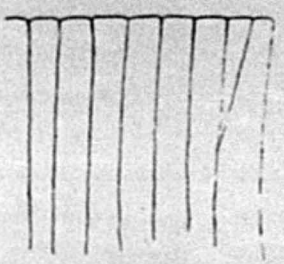

Fig. 34.
Dialeurodes tristylii new species.
Margin and submarginal markings of pupa case.

than long, truncate on the hind end, occupying most of the orifice. Lingula slightly exposed. Pupa case-about 1.77 mm. long, about 1.55 mm. wide, distance between vasiform orifice and hind end about 0.323 mm.

Host.—Tristylium ochnaceum, attacking the upper side of leaf.

Hab.—Hokuto near Taihoku; Yappitsu (Suo-Gun, Taihoku Prefecture).

Abundant specimens were taken by me in October 1929 at Hokuto, and a single pupa case, at Yappitsu on August 17, 1934. Closely allied to *Dialeurodes eugeniae* MASKELL, but easily distinguished from it by the presence of eminent thinner areas on the dorsum.

Dialeurodes ardisiae new species.

(Pupa case) White, broadly blackish longitudinally on the median area of dorsum, with no secretion. Broadest about the middle, a little narrowed towards both ends, about 1.38 times as long as wide, not constricted, somewhat pointed at the hind end, with a median ridge. Mid-thoracic suture not reaching the margin; transverse suture reaching the longitudinal folds; thoracic and abdominal segments distinct; rhachis distinct, those on the abdomen not reaching the margin, with about 4 sclerotic pointed tubercles in a transverse row on the anterior margin of the 2nd—6th rhachis. Dorsum with many minute paired-pores sparsely scattered; 26 very short pointed lanceolate spines arranged in a single row along the whole margin, which are equal in length, not reaching beyond the margin, and 14 of them are on the cephalothorax; head and each thoracic and abdominal segment with a pair of similar setae on the

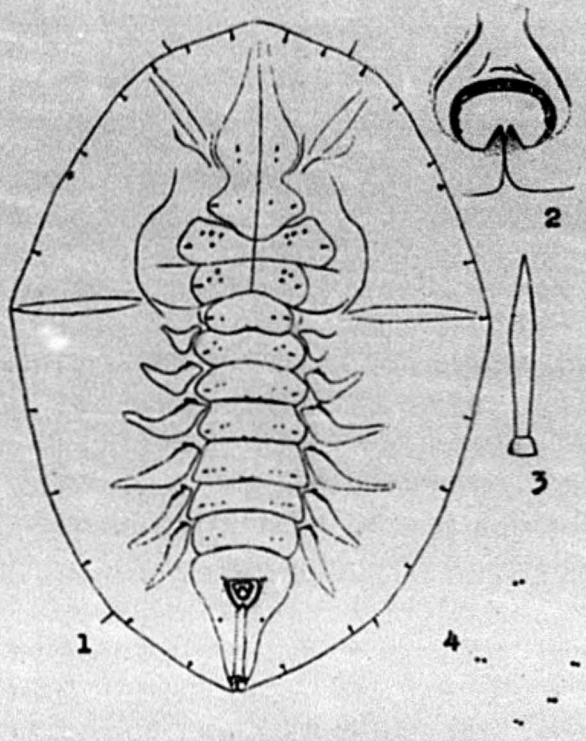

Fig. 35.
Dialeurodes ardisiae new species.
(Pupa case)
1. Dorsal view. 2. Caudal tracheal pore.
3. Submarginal spine. 4. Dorsal paired-pores.

median area. Margin scarcely or very faintly crenate, with the usual setae short. Thoracic tracheal folds indistinct, without dots and markings; the pores very small, entirely closed, semilunar, separated from the margin, with some indistinct minute teeth on the mesal side. Caudal furrow distinct, narrow, between broad longitudinal lobes reaching the pore, scarcely widened anteriorly, with no markings; the pore similar to, but a little larger than, the thoracic ones. Ventral caudal fold with minute dots. Vasiform orifice subcordate, narrowed towards the hind end, narrowly but distinctly, notched at the hind end, nearly as long as wide, with no teeth, the anterior marginal area not well defined. Operculum rounded on the hind end, occupying somewhat more than half the orifice. Lingula exposed. Pupa case-about 1.5 mm., caudal furrow—about 0.162 mm.

Host.—Bladhia sp.

Hab.—Mutosan (Heito-Gun, Takao Prefecture).

A few specimens were taken by me on March 23, 1934. Allied to *D.* (*Rhachisphora*) *machili* TAKAH. and *D.* (*R.*) *maesae* TAKAH., but differs from the former in lacking many minute dorsal capitate setae, the different shape of tubercles on the abdominal rhachis, possessing spines on the median area of abdomen, the thoracic and caudal tracheal pores entirely closed and separated from the margin, the narrower caudal furrow, etc., and from the latter in the dorsum not reticulated, the vasiform orifice shorter, the thoracic tracheal pores distinctly separated from the margin, etc.

A single incomplete specimen of a new species of *Rhachisphora* was also taken by me on *Eugenia* sp. at Mutosan, which will be described when better material is obtained. In *D. machili* TAKAH., the thoracic tracheal pores usually have a small distinct tooth.

Aleurotuberculatus rhododendri new species.

(Pupa case) Pale brown, with no secretion evident. Broadest about the middle, more narrowed on the posterior part, not constricted, not indented at the hind end, soft. Mid-thoracic and transverse sutures not reaching the margin of dorsal disk; abdominal segments distinct. Submarginal area narrow, not well defined, with markings as in *A. melastomae* TAKAH. Dorsum with faint corrugations on the dorsal disk except on the median area; a pair of very long curved setae present on the cephalothorax, basal abdominal segment and also near the hind end, the last pair shorter; a pair of short setae present near the vasiform orifice; cephalothorax with some 4 pairs of short rounded tubercles not eminent. Marginal teeth minute, but distinct, rounded apically, wider than long, 16 of them occupying

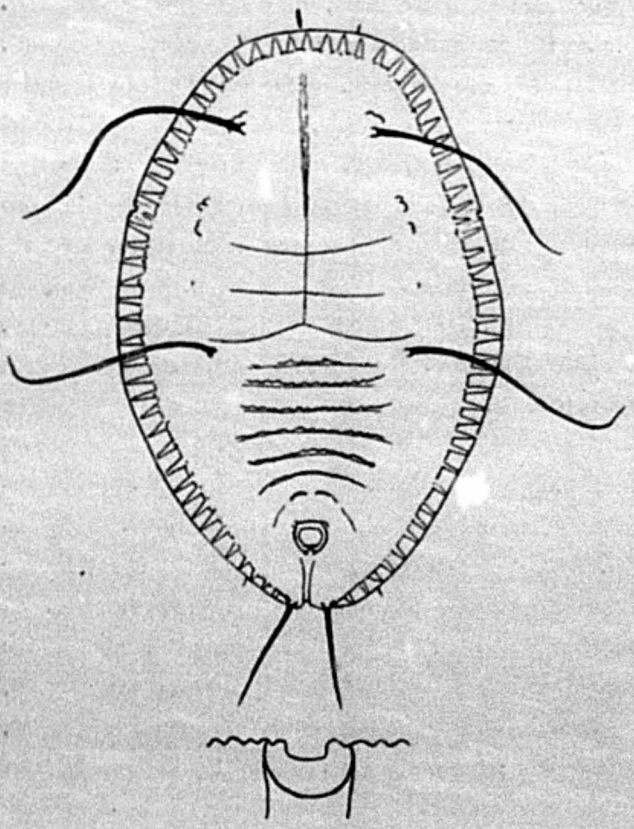

Fig. 36.
Aleurotuberculatus rhododendri new species.
(Pupa case)

about 0.046 mm.; usual marginal setae normal. Thoracic tracheal folds not discernible, the clefts very small, widely opening, shallow, without teeth. Caudal furrow distinct, rather wide, slightly widened towards the vasiform orifice, thickened on the lateral margin, with no distinct markings; the cleft as in the thoracic ones. Vasiform orifice large, rounded, nearly as long as wide, somewhat shorter than the caudal furrow, a little narrowed posteriorly, slightly notched at the hind end, without teeth. Operculum somewhat wider than long, rounded, occupying over two-thirds of the orifice. Lingula concealed.

Venter with on marginal rim. Pupa case—about 0.7 mm., candal furrow—about 0.055 mm.

Host.—Rhododendron sp.

Hab.—Mizuho (Karenko Province).

Some specimens were taken by me on May 21, 1934. Closely allied to *A. melastomae* TAKAH., but differs in the submarginal area not defined on the venter, the marginal teeth distinct and larger, the dorsum with faint corrugations, the mesonotum without papillae on the hind margin, etc.

Aleurotuberculatus piperis new species.

(Pupa case) White, with no secretion eminent. Elliptic, somewhat constricted across the thoracic tracheal clefts and also across the middle of abdomen, not or

very slightly indented at the hind end, broadest about the middle, about 1.5 times as long as wide, thin. Mid-thoracic suture nearly reaching the margin; transverse suture not so; abdominal segments distinct. Dorsum lacking papillae and granules, with a pair of very long thin curved setae on the head and basal abdominal segment, which are far reaching beyond the margin; a pair of much shorter setae present near the hind end and near the vasiform orifice; some minute circular pores discernible on the dorsum; cephalothorax with a pair of very small rounded tubercles on the meso- and metanota. Submarginal area very narrow, not defined. Marginal teeth minute, triangular, much wider than long, rounded apically; anterior marginal setae short, but the posterior ones longer. Venter with a very narrow marginal rim, the mesal margin of which is as in *A. melastomae* TAKAH. Thoracic tracheal folds not distinct, but wide, the clefts small, but distinct, widely opening, a little wider than deep, nearly quadrangular, somewhat narrowed distally, without teeth, as in *A. multipori* TAKAH. Caudal furrow distinct, wide, a little broadened towards the base, but not expanded basally, a little more than twice as long as wide, with many rather large irregular sculptures except on the distal small part, the pore transversely oval, but not entirely closed, slightly larger than the thoracic ones, without teeth. Vasiform orifice rounded, as long as wide, slightly notched at the hind end, without teeth, the anterior marginal area much expanded. Operculum wider than long, truncate distally, occupying more than half the orifice. Lingula reaching beyond the hind margin of the orifice. Pupa case-about 0.8 mm., caudal furrow-about 0.065 mm. long, about 0.023 mm. wide, vasiform orifice including margin-about 0.051 mm. long, ventral marginal rim-about 0.018 mm. wide.

Host.—Piper sp.

Hab.—Ekiju near Piyanan (Taihoku Prefecture).

A few specimens were taken by me on August 14, 1934. Closely allied to *A. longispinus* TAKAH., but differs in the abdomen constricted about the middle, the thoracic tracheal clefts narrowed distally, the submarginal area with no ridges, and the cephalothorax with 2 pairs of tubercles.

In the shape of pupa case, this species much resembles *A. jasmini* TAKAH., but is different from it in lacking dorsal papillae along the margin and in the structures of thoracic tracheal clefts, as well as in other characters.

Aleurotuberculatus multipori new species.

(Pupa case) White, with no secretion evident. Elliptic, thin, very slightly constricted just behind the thoracic tracheal clefts, not indented at the hind end, broadest on the basal part of abdomen, about 1.4 times as long as wide. Mid-

thoracic suture reaching the margin, transverse suture not so; meso-and metanota defined and abdominal segments distinct on the median area. Submarginal area very narrow, not well defined, but distinct, about 74–80 small, nearly conical, papillae arranged in a single row along the whole margin of dorsal disk; the papillae distinct, rounded or more or less pointed apically, those near the thoracic tracheal clefts much reduced in size. Dorsum with numerous very small short rounded papillae scattered, but not so densely, except on the submarginal and median areas, and scarcely present on the marginal narrow area of dorsal disk; each segment with some similar papillae in a row on the hind margin on the median area; the papillae mostly much smaller than those on the margin of dorsal disk; basal 6 abdominal segments each with peculiar markings at the middle of the posterior half as in some species of the genus; cephalothorax very slightly shorter than the abdomen, with 3 pairs of small rounded tubercles (one pair on each thoracic segment), and a pair of very long thin curved setae on the head; a pair of similar setae also present on the basal abdominal segment and a pair of much shorter ones near the hind end; the dorsal setae variable in length, usually far reaching beyond the margin; a pair of usual short setae present near the vasiform orifice. Marginal teeth minute, wider than long, rounded apically, triangular; usual marginal setae short. Thoracic tracheal folds not discernible, the clefts distinct, widely opening, but slightly narrowed distally, nearly as deep as wide, lacking teeth, quadrangular when seen from above, a well-defined nearly semicircular area present adjacent to each cleft. Caudal furrow distinct, wide, not expanded basally, but broadened towards the base, a little more than twice as long as wide, with indistinct irregular markings, the cleft nearly as in the thoracic ones. Vasiform orifice wider than long, slightly notched at the hind end, lacking teeth, the anterior marginal area much expanded. Operculum constricted on the distal part, occupying most of the orifice. Pupa case-about 0.75 mm., caudal furrow including cleft-about 0.065 mm. long, about 0.027 mm. wide, vasiform orifice including margin—about 0.046 mm. long, submarginal area—about 0.013 mm. wide.

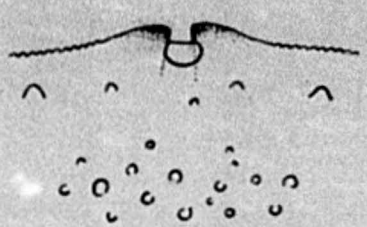

Fig. 37.

Aleurotuberculatus multipori new species.

(Pupa case)

Margin, dorsal papillae and thoracic tracheal cleft.

Host.—Oreocnide pedunculata.

Hab.—Habon near Musha (Taichu Prefecture), Ekiju near Piyanan (Taihoku Prefecture).

Differs from *A. longispinus* TAKAH. in the dorsum with many papillae, the metanotum with a pair of dorsal tubercles, the basal 6 abdominal segments with median markings, the thoracic tracheal folds not distinct, with the cleft deeper and narrowed distally, the caudal furrow narrower, with indistinct markings, the papillae along the margin of dorsal disk not forming ridges reaching the margin, etc. *A. jasmini* TAKAH. (Part I, p. 26) differs from this species in the abdomen distinctly, but shallowly, constricted across the middle, the metanotum with 2 pairs of tubercles and a pair of large dusky patches, the dorsum lacking many papillae scattered, with shorter setae, the caudal furrow narrower, the thoracic tracheal clefts different in structure, etc.

Aleurotuberculatus thysanospermi TAKAH.

Aleyrodidae of Formosa, III, p. 5[illegible] (1934).

Some pupa cases were collected by me on an unknown tree at Suisha in August 1934. In these specimens the cephalothorax and basal abdominal segment have a pair of long simple setae, the abdominal segments are faintly discernible, and the dorsum is wanting furrow-like markings, but with many small short papillae mostly on the sublateral area, but not on the marginal area. The specimen described formerly seems to be a younger larva.

Taiwanaleyrodes indica SINGH.

Aleurothrixus indicus, SINGH, Mem. Dept. Agr. India, XII, 1-2, p. 84 (1931).

Host.—Machilus sp.

Hab.—Botan (Koshun-Gun, Takao Prefecture).

4 pupa cases were taken by me on May 25, 1934. Hitherto known only from India. This species has a distinct caudal furrow, the vasiform orifice distinctly notched and the narrow submarginal area well defined on the venter, but the thoracic tracheal clefts or pores are wanting; and I place the aleyrodid in this genus. Three pairs of eminent slender tubercles

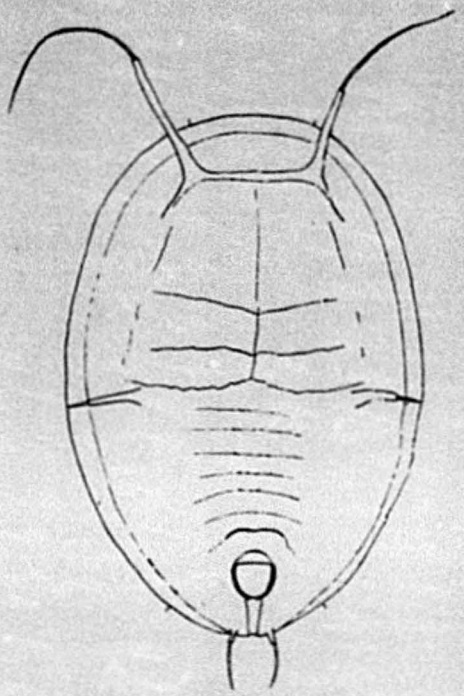

Fig. 38.
Taiwanaleyrodes indica SINGH.
(Pupa case)

each bearing a long seta easily distinguish the species from others of the genus. The anterior pair of the dorsal tubercles are on the median area of cephalothorax and far separated from the submarginal area (in this respect the figure of Singh seems to be incorrect).

Tuberaleyrodes machili TAKAH. var. **actinodaphnis** new veaiety.

(Pupa case) White, with no secretion evident. Elliptic, not constricted, thin, not indented at the hind end. Mid-thoracic and transverse sutures not reaching the margin; abdominal segments faintly discernible. Dorsum with many rather large and small short rounded papillae except on the submarginal area, and many thin lines running mesad from the margin on the submarginal area; cephalothorax with 14 finger-like tubercles, and 4 short submarginal tubercles on the anterior part; abdomen with 14 finger-like tubercles, a pair of short tubercles at the hind end and a pair of long simple setae in front of the vasiform orifice; the finger-like tubercles rather large, subequal in length, not smooth, each with an apical seta which is rather long, stout, straight or somewhat curved, somewhat capitate and shorter than the tubercles. Thoracic tracheal folds not discernible, the clefts or pores also not discernible in most specimens. Caudal furrow distinct, wide, gradually expanded anteriorly, somewhat thickened on the lateral margin, with indistinct markings; the distal cleft widely opening, sclerotic on the margin, rounded, without teeth. Margin scarcely crenate, with the usual setae long. Vasiform orifice rounded, slightly longer than wide (including the margin), slightly indented at the hind end, without teeth, the anterior marginal area expanded. Operculum a little wider than long, truncate distally, occupying most of the orifice. Lingula reaching the hind

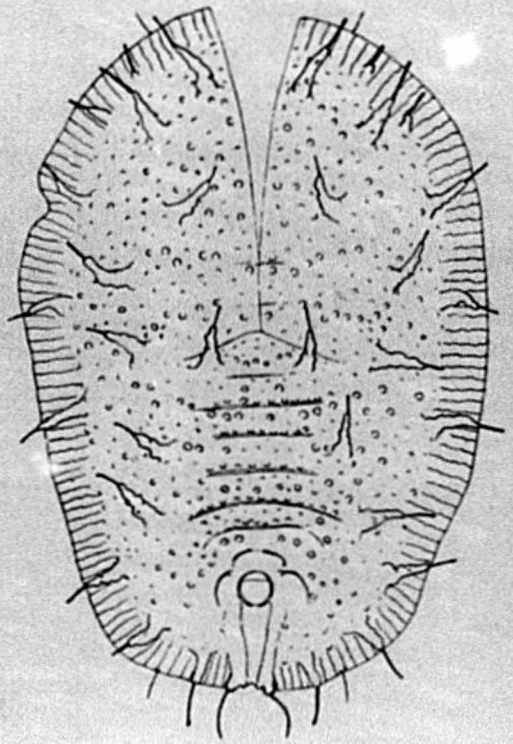

Fig. 39.
Tuberaleyrodes machili TAKAH., var. *actinodaphnis* new variety.
(Pupa case)

end of the orifice. Pupa case-about 1.1 mm., vasiform orifice including margin-about 0.06 mm., caudal furrow-about 0.129 mm., longest finger-like tubercle-about 0.09 mm.

Hosts.—Actinodaphne sp., Cinnamomum sp.

Hab.—Botan (Koshun-Gun, Takao Prefecture), Ishiyama (Kizan-Gun, Takao Prefecture).

Some pupa cases were collected by me on May 25, 1934. Differs from the typical form in possessing more dorsal tubercles, which are longer, and the eminent dorsal papillae.

Aleurotrachelus tuberculata Singh.

Records Ind. Mus., XXXV, 3, p. 343 (1933).

Host.—Lindera sp.

Hab.—Shinten near Taihoku.

Some specimens were taken by me on November 23, 1933. Previously known only from India. Differs from the original description in the dorsum scarcely with minute pores and the median area of abdomen with papillae scattered rather densely.

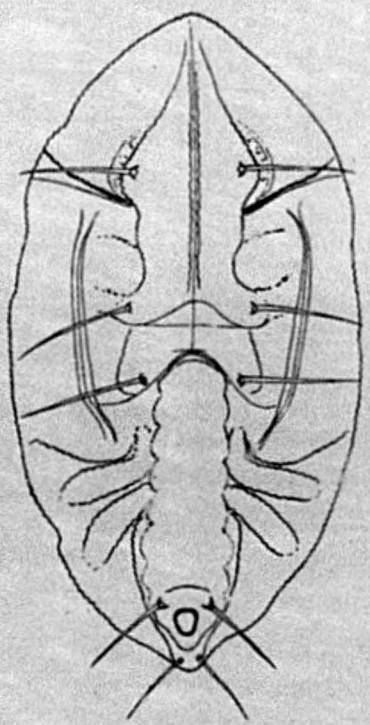

Fig. 40.
Aleurotrachelus tuberculata Singh.
(Pupa case)

Aleurotrachelus maesae new species.

(Pupa case) Yellowish brown, shining, with no secretion evident. Nearly elliptic, slightly produced and rounded at the anterior end, broadest about the middle, about 1.35 times as long as wide, not constricted, not indented at the hind end, with an eminent ridge on the cephalothorax. Mid-thoracic suture nearly reaching the margin; transverse suture nearly reaching the longitudinal folds, eminently produced anteriorly on the median part, nearly reaching the suture between the meso- and metanota; median area of abdomen very narrow, the segments distinct, but the 7th and 8th segments not well defined; rhachis distinct, some of which are nearly reaching the margin; longitudinal folds wanting tubercles. Dorsum with some very small circular pores, a pair of short setae in front of the vesiform orifice, and near the hind end, and 3 pairs of minute submarginal setae on the posterior part, laterad of the orifice. Marginal teeth distinct, in 2 rows; the outer teeth longer than wide, rounded on

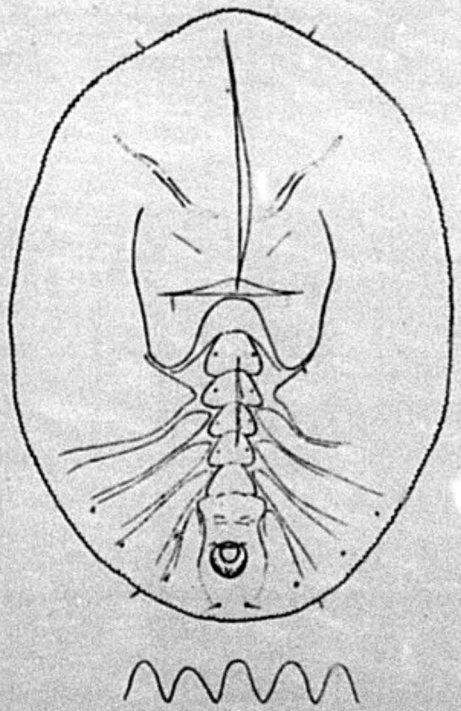

Fig. 41.
Aleurotrachelus maesae new species.
(Pupa case)

the distal margin, narrowed distally, the inner ones much wider than long, broadly rounded apically, 10 teeth occupying about 0.073 mm. Thoracic tracheal folds and caudal furrow and pores not discernible. Vasiform orifice not elevated, subcordate, thickened on the margin, as long as wide, not notched, with about 4 very small indistinct teeth on each side and a median distinct spine near the hind end, the anterior marginal area not expanded. Operculum narrowed towards the hind margin, rounded distally, somewhat wider than long, occupying nearly half the orifice. Lingula concealed. Pupa case—about 0.8 mm.

Host.—Maesa formosana.

Hab.—Miharashi (Taito Province).

A single specimen was collected by me on March 22, 1934. Related to *A. caerulescens* SINGH, but differentiated from it by the absence of eminent pores on the dorsum, as well as by the narrow median area of abdomen.

Aleurotrachelus pyracanthae new species.

(Pupa case) Black, with no secretion. Oval, broadest about the middle, about 1.4 times as long as wide, a little indented at the front end, slightly pointed at the hind end, not much convex dorsally, not constricted, strongly sclerotized. Dorsum lacking spines, distinct pores and papillae, with rather large corrugations except on the marginal area, a pair of longitudinal darker areas, and many broad short darker areas running mesad from the margin, these darker areas discernible in specimens treated with potash; a pair of rather small somewhat transparent areas not well defined present on the cephalothorax; longitudinal furrows absent; a pair of long simple setae present near the hind end. Mid-thoracic suture nearly reaching the

margin; transverse suture not so; abdominal segments not eminent: rhachis a little developed. Margin more sclerotic, the teeth in a row, nearly as long as wide, slightly narrowed towards the distal margin, broadly rounded or nearly truncate distally, 9 teeth occupying about 0.092 mm. Vasiform orifice rather large, a little longer than wide (excluding the margin), subcordate, not notched, elevated, thickened on the lateral margin, with 3 pairs of slender teeth, the anterior marginal area not expanded. Operculum similar in shape to the orifice, occupying most of it. Lingula concealed. Distance between the orifice and the hind end shorter than the orifice. Thoracic tracheal folds, caudal furrow and pores absent. Pupa case—about 0.8 mm., vasiform orifice (excluding margin)—about 0.065 mm.

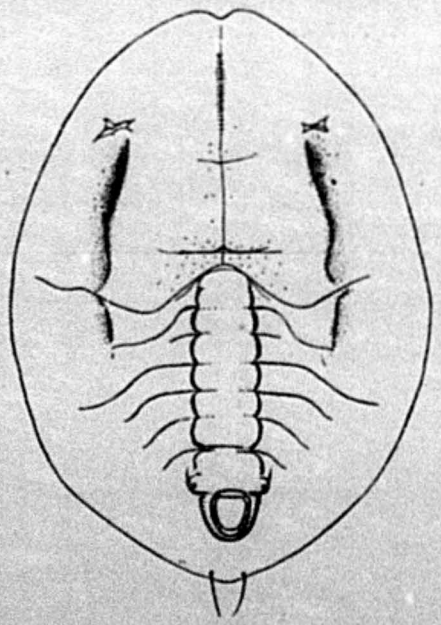

Fig. 42.
Aleurotrachelus pyracanthae new species.
(Pupa case)

Host.—Pyracantha koidzumi.

Hab.—Taito.

A few specimens were taken by me on March 21, 1934. This species is not a typical form of the genus, lacking distinct longitudinal furrows on the dorsum, but referable to the genus rather than to other proposed genera.

Pealius psychotriae new species.

(Pupa case) White, with white thin wax along the margin. Elliptic, broadest about the middle, slightly constricted across the middle of cephalothorax, about 1.5 times as long as wide, not indented at the hind end, soft. Mid-thoracic suture nearly reaching the margin, transverse suture not reaching it; abdominal segments distinct. Dorsum without papillae, striae and sculptures, but with some very small paired-pores*; 28 simple setae arranged in a single row along the whole margin, of which 2 on the hind end are much longer and stouter, the remaining 26 short, equal in length, sometimes reaching a little beyond the margin, each arising from a very

* One of the paired-pores is larger than the other.

small tubercle and 14 of them are on the cephalothorax; a pair of small slightly capitate setae present on the cephalothorax, a pair of similar ones sometimes present on the basal abdominal segment; usual setae near the vasiform orifice short, normal. Margin narrowly sclerotic, with many small sclerotic teeth in 2 rows; the outer teeth broadly rounded or sinuate on the distal margin, each with a small transculent area near the base, the inner teeth very short, much wider than long, a little pointed apically; usual marginal setae normal. Thoracic tracheal folds and pores and caudal furrow not discernible. Vasiform orifice rather large, wider than long, truncate or slightly indented on the hind margin, lacking teeth. Operculum nearly similar in shape to the orifice, occupying a little more than half the orifice. Lingula rather large, setose, knobbed, extending beyond the hind margin of the orifice, nearly reaching the apex of pit, the knobbed part longer than wide, pointed at the hind end, with a pair of long setae near the tip. Pit short, a little extending beyond the hind margin of the orifice, not well defined posteriorly, not reticulated, with no or a few longitudinal irregular sculptures. Distance between the orifice and hind end nearly as long as the orifice. Pupa case—about 0.72 mm.

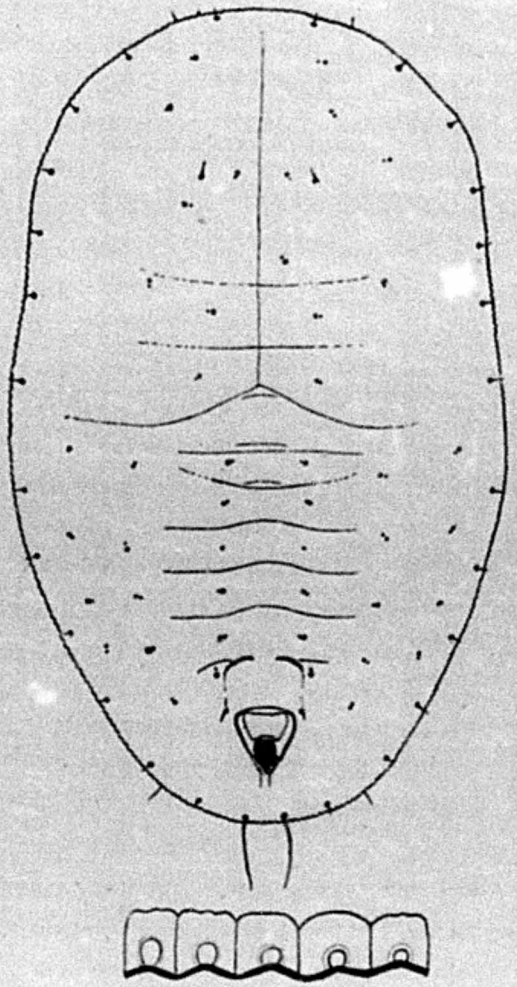

Fig. 43.
Pealius psychotriae new species.
(Pupa case)
Dorsal view and margin.

Host.—Psychotria serpens.

Hab.—Taihoku, Sozan.

Very common, but has not been found until recently. Described from specimens taken by me on April 20, 1934. Near *Pealius misrae* SINGH, but differs in the shape of lingula and pit, the shorter submarginal setae, etc.

Pealius damnacanthi new species.

(Pupa case) Nearly white, densely covered with white cottony wax. Elliptic, broadest about the middle, not constricted, not more narrowed on either end, about 1.6 times as long as wide, not indented at the hind end. Mid-thoracic suture indistinct, reaching the margin; transverse suture not distinct laterally, nearly reaching the margin, not extending forwards on the lateral part; suture between the meso- and metanota distinct, long, nearly straight; abdominal segments distinct, suture between the 2nd and 3rd segments extending forwards on the lateral part, nearly reaching the suture at the base of the 2nd. Dorsum smooth, without papillae, with a few minute circular pores, a pair of short setae on the cephalothorax, and 22 or 24 simple setae arranged in a row along the whole margin except on the posterior one-third or half of cephalothorax, of which 14 are on the abdomen and the last 2 of them are much longer and a little curved, far reaching beyond the margin; the remaining setae rather short, reaching to or slightly beyond the margin; a pair of long setae present near the vasiform orifice, which are a little shorter than the last pair of submarginal ones; meso- and metathoracic and basal 6 abdominal segments with a pair of faint markings along the anterior margin, which are often not discernible; the 7th abdominal segment with a pair of transverse thickenings near the anterior margin, the 8th segment very short. Margin narrowly sclerotic, the teeth very short, small, much wider than long, rounded; a rounded wide ridge running mesad from each tooth to the base of the marginal sclerotic part and the teeth appear to be in 2 rows; the ridges much longer than wide, with a longitudinal pale area at the middle, nearly parallel on the sides or a little widened towards the base, usually not in contact with each other; 20 teeth occupying about 0.092 mm.; marginal usual setae short, as long as the dorsal submarginal ones. Thoracic tracheal folds and pores and caudal furrow not discernible. Vasiform orifice large, narrowed towards the hind end, somewhat wider than long, a little rounded at the base of lateral margin, nearly straight on the hind margin, lacking teeth; the anterior marginal area widened. Operculum much wider than long, rounded or straight on the hind end, a little constricted basally, occupying half the orifice. Lingula setose, knobbed, reaching the hind margin of the orifice, with a very small lateral tubercle on the base of the knobbed part and a pair of long subapical setae. Pit a little extending beyond the orifice, but not laterally, defined, more or less pointed at the hind end, with no markings. Venter with a well-defined narrow marginal rim or vertical pleura. Pupa case—about 0.81 mm., vasiform orifice excluding anterior margin—about 0.051 mm. long, about 0.06 mm. wide (including margin), dis-

tance between vasiform orifice and hind end—about 0.08 mm., marginal sclerotic part—about 0.018 mm. wide.

Hosts.—Damnacanthus indicus, var. formosanus, Eurya acuminata.

Hab.—Piyanan-Ambu, Ekiju near Piyanan, Yappitsu (Suo-Gun, Taihoku Prefecture).

Many specimens were taken by me on August 13, 1934, when the pupa cases were abundant on *Damnacanthus*. CLOSELY allied to *P. psychotriae* TAKAH., but differs in the marginal sclerotic area wider, the narrower teeth, the pupa case wider and not constricted, the fewer setae along the margin, etc.

Pealius machili new species.

(Pupa case) White, with a narrow thin secretion along the margin. Elliptic, not constricted, not indented at the hi end. Mid-thoracic and transverse sutures reaching the margin, transverse suture with some 8 very small rounded papillae in a row on the lateral part; abdominal segments distinct, but the 7th and 8th segments not defined on the median area. Dorsum with many very small circular pores scattered, and 32 long a little curved simple bristles in a row along the whole margin, which bristles are equal in length, each arising from a small tubercle. Meso- and metanota and basal 6 abdominal segments each with a pair of markings on the median area. Margin very narrowly sclerotic, the teeth very small, much wider than long, rounded apically, expanded towards the base, about 13 of them occupying 0.092 mm.; usual marginal setae normal. Thoracic tracheal folds and pores not discernible. Caudal furrow distinct, longer than the vasiform orifice, wide, a little narrowed posteriorly, reaching the margin, not defined laterally, reticulated on the

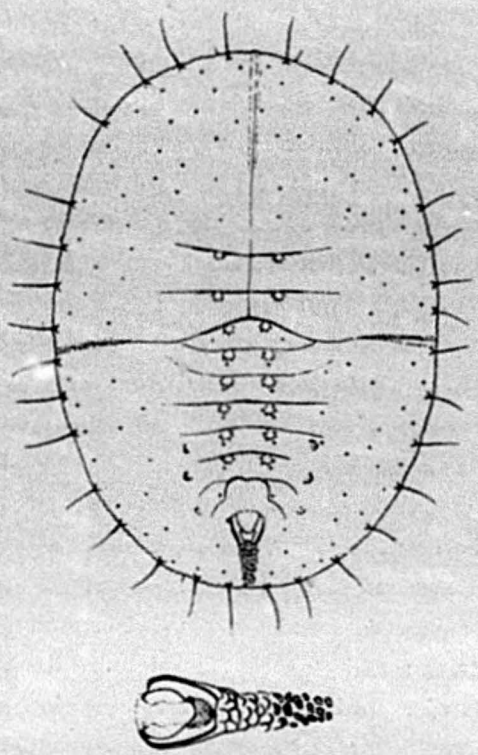

Fig. 44.
Pealius machili new species.
(Pupa case)
Dorsal view, and vasiform orifice and caudal furrow.

basal half, but with distinct large polygonal sculptures on the distal half. Vasiform orifice longer than wide, nearly truncate on the distal end, somewhat narrowed posteriorly, wanting teeth, a little thickened on the lateral margin. Operculum occupying half the orifice. Lingula exposed, setose, knobbed, nearly reaching the hind margin of the orifice; the knobbed part wider than long, slightly divided apically, with a small rounded lateral protuberance at the base. Pupa case—about 0.82 mm., caudal furrow—about 0.078 mm., submarginal seta—about 0.069 mm.

Host.—Machilus sp.

Hab.—Botan (Koshun-Gun, Takao Prefecture).

3 pupa cases were taken by me on May 25, 1934. Closely allied to *Pealius kankoensis* TAKAH. (*Trialeurodes kankoensis* TAKAH.), but differs in the characters of caudal furrow. Also differs from *P. celti* TAKAH. in the shorter lingula, the more slender submarginal setae, e

Aleurolobus hederae new species.

(Pupa case) Black, a little shining, with very thin nearly transparent whitish secretions along the whole margin, not becoming pale in most specimens even when treated with potash. Broadest about the middle, about 1.3 or 1.4 times as long as wide, not constricted, not indented on the margin, flattened, strongly sclerotized. Mid-thoracic suture reaching the margin of case, transverse suture reaching the margin of dorsal disk; abdominal segments distinct. Eye spots distinct. Submarginal area well defined except on the posterior small part, as in *Aleurolobus rhododendri* TAKAH. (Part III, p. 62), with many distinct markings, many minute paired-pores in a row and 22 very short setae arranged in a row on the whole basal margin; the mesal pore in each pair of the pores mostly black. Dorsal disk with some corrugations, a pair of minute setae on the head and basal abdominal segment, and some minute paired-pores; cephalothorax with some 7 or more pairs of small transversely oval areas on the dorsum; each abdominal segment with a pair of transversely narrow, oval, areas on the anterior margin, which are not so distinct as in *A. rhododendri* TAKAH. Margin sclerotized, the teeth very short, broadly rounded, much wider than long; the usual setae short, thin; a pair of similar setae present at the hind end. Thoracic tracheal folds hardly discernible, with numerous minute dots; combs not protruding, with 3 distinct stout teeth, which are rounded apically, wider than long, a little narrower than other marginal teeth; a large circular defined area present adjacent to each comb, thickened on the margin, somewhat shorter than or as long in diameter as half the width of the submarginal area, sometimes not well defined on the mesal part. Vasiform orifice

triangular, a little longer than wide, rounded apically, surrounded with a lobed area nearly reaching the margin, with some 5 pairs of indistinct lateral teeth and some imbrications on the distal part. Operculum similar in shape to the orifice, occupying most of it. Lingula normal, not exposed. Caudal furrow distinct, narrow, not reaching the margin, somewhat longer than the orifice, with many rather large, irregular, polygonal sculptures except on the basal part; the comb as in the thoracic ones.

Pupa case-about 1.25 mm., vasiform orifice—about 0.092 mm., submarginal area —about 0.13 mm. wide, thoracic tracheal comb—about 0.037 mm. wide.

Host.—Hedera formosana, attacking both surface of leaf.

Hab.—Heiganzan (Tosei-Gun, Taichu Prefecture) (altitude about 2000 meters).

Numerous specimens were taken by me on August 12, 1934. Closely allied to *A. rhododendri* TAKAH., but differs in the presence of a defined area adjacent to each thoracic tracheal comb, the stouter teeth of the combs, the shorter marginal setae, and the wider and harder pupa case.

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